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FARMERS DIGEST

MARCH, 1942

Volume 5
Number 11

25c a Copy
$2.00 a Year

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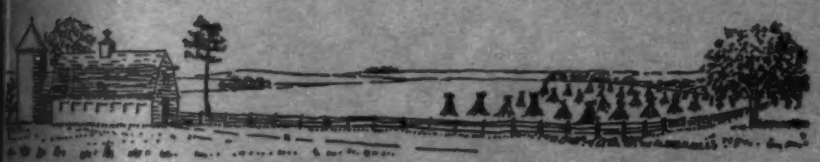

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The Farmer's Digest

Published Monthly at Ambler, Pennsylvania
by the Farmer's Digest, Inc.

25c a Copy *1 Year $2.00*

2 Years $3.50 *3 Years $5.00*

Foreign and Canadian Subscriptions $2.50 a Year

Entered as second-class matter at the Post Office at Ambler, Pa., May 5, 1937, under act of March 3, 1879

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The Farmer's Digest

Volume 5 March, 1942 Number 11

Stretching Our Rubber Supply

Condensed from Marketing Activities

Thomas D. Mallery
Bureau of Plant Industry

THE Department of Agriculture and the Department of Commerce have recognized for many years the desirability of producing more natural rubber in the Western Hemisphere. Many species of plants have been analyzed for their rubber content and some research has been carried on under controlled conditions in the United States with tropical plants not accustomed to the climate of the North Temperate Zone. As early as 1923 extensive surveys were made of the potential rubber-growing areas of Central and South America, though few tangible results grew out of this work. The existing sources of rubber seemed secure. But in July, 1940, when our rubber supply was threatened, a more intensive survey was begun in close co-operation with fifteen of the Latin-American countries. Within sixty days of the time the survey parties began their work, 100,000 rubber tree seedlings were growing in the first co-operative nursery in Central America. Since then a central experiment station has been established in Costa Rica, co-operative stations in Brazil, Honduras and Haiti, and large national nurseries in Mexico, Panama, Colombia, Guatemala, Peru, Ecuador, and Venzuela. Already many individuals and private companies have made experimental plantings of the Para rubber tree. These plantings may be rapidly expanded to plantation proportions as the land is cleared and the best types of planting material are made available. Under favorable conditions it will require from five to seven years to bring these trees into production, but, even so, the development of the Para rubber tree appears to be our best bet.

The original home of this tree, known scientifically as *Hevea brasiliensis*, is in a strip across South America extending ten degrees north and south of the equator and lying principally in

Reprinted from Marketing Activities, Jan., 1942, Washington, D. C.

Brazil, Peru, Colombia, and Bolivia. While considerable quantities of rubber have been taken from the scattered wild trees in this area, the industry has been developed only slightly and nothing has been done to place it on a scientifically sound basis. Rubber production in the Amazon River Valley is a mere drop in the bucket compared with the total world supply, though consideration of the great quantities of rubber produced in other parts of the world from parent plant material transplanted from Brazil gives some idea of what may be accomplished in this hemisphere.

The plantation system of producing rubber, as developed in the Far East, is the most economical. Contrasted with native rubber trees, which usually are found as few as two or three per acre, plantation trees are planted at the rate of 150 to 400 per acre. From this number 500 to 2,000 pounds of rubber may be harvested annually, year after year, depending upon the quality of the trees and the climatic conditions. The plantations need not be large, for over half of the world's rubber is produced on relatively small one-family farms. This is the type of plantation enterprise that is being encouraged in Latin-America.

To assure a continued supply in the meantime, and to "stretch" our reserves of rubber as far as possible, efforts are being made to bring thousands of native Para rubber trees into production—many for the first time. Recent survey reports indicate that rubber production in Brazil alone can be increased four to five times. Fortunately many of the best plantation practices can be put into operation in the utilization of wild rubber trees. Scientific methods of tapping will prolong the productiveness of the trees indefinitely and modern methods of preparing the rubber for market will eliminate waste and insure a better product. Thus the expansion of the existing native rubber industry will, in the long run, aid the development of the extensive plantation rubber program recently initiated by the Department of Agriculture and our co-operating neighbors to the south.

Though research and experience have shown that we must look to the Para rubber tree as our principal source of rubber, it should be pointed out that thousands of plant species scattered over the major portion of the globe contain rubber. Chemically and physically rubber is the same, no matter what its source. However, more impurities accompany rubber obtained from some plant species than from others, and most plants yield rubber only once or for a very limited time before they must be

replaced. Resins are one of the most common types of impurities occurring with rubber and their removal is usually difficult, time consuming, and expensive.

Thomas A. Edison did much pioneer work in the search for rubber producing plants, especially among the common wild flowers. He carried out extensive experiments with the well-known goldenrod, for example, and found that this plant contains a high percentage of rubber and grows abundantly over large areas, though it is impossible to extract the rubber in a pure condition by known methods. Limitations of this kind, and, in numerous cases, low yields, are characteristic of many native plants that are being brought to the attention of the Department of Agriculture these days.

The native plant population of the North American Continent has two representatives that have been developed to some extent in the past as complementary sources of rubber. They are the Central American rubber tree, *Castilla elastica,* and the silvery leaved shrub of Northern Mexico, *Parthenium argentatum* or guayule. Castilla belongs to the fig family, while guayule is a member of the sunflower or aster tribe. A reasonably pure grade of rubber can be obtained from each of these plants.

The Castilla tree is tapped only two or three times annually. After each tapping there is a continuous flow of latex—the rubber containing juice—but a long period must elapse before the latex is sufficiently renewed to repay tapping. The Hevea or Para rubber tree, on the other hand, responds to frequent tapping, the flow of latex continuing for two to three hours each tapping day. Since Castilla does not possess this type of wound response, it has not received as much attention as the Hevea. Under the impetus of war needs, however, the tapping of this type tree will be encouraged and its latex used whenever possible to supplement or replace Para rubber. In late years Castilla rubber has been used largely in the manufacture of rubberized cloth.

The guayule is native to certain semi-arid areas in the southwestern United States, as well as to Northern Mexico, and it grows well in the more southern Pacific Coast valleys. Although it is characteristically a desert shrub, it responds to cultivation without losing its rubber-yielding properties. The extensive natural areas of this shrub in Mexico have been harvested on a moderate scale since the beginning of the century, and much work has been done in this country by a private corporation on the cultivation of guayule and the selection of improved strains.

Guayule rubber has not been able to compete with Para rubber during normal times, chiefly because it is somewhat more expensive to produce. A Para rubber tree, once established, can be tapped over a long period of time, say fifty years or more. The guayule, on reaching maturity, is pulled up and mascerated in the process of extracting its one contribution of rubber. Para rubber contains only three to five percent of impurities when it leaves the plantation, whereas guayule rubber contains fifteen to twenty percent of impurities when extracted from the plant. The impurities, largely resins, can be removed, but the process adds to production costs.

In view of the heavy demand, however, production costs will not be a factor limiting the fullest utilization of this normally uneconomical source of rubber. Guayule production will doubtless be an important contribution to winning the war, although about four years are required to bring a crop to maturity.

Artificial or synthetic rubber will also help in our enforced "rubber - stretching" activities. Here again the production costs are high, and in most of the manufacturing processes valuable natural resources, such as coal and petroleum, are basic requirements. There are a number of synthetic rubbers now being produced, some of which fill certain needs more successfully than do natural rubbers, but none of them will serve all of the purposes for which natural rubbers are used.

The rubber supply problem is probably not serious so far as war needs are concerned. How serious it is with respect to civilian requirements only time will tell. In this regard, a whole lot will depend on our willingness to conserve our allotment, and on our ability to develop new sources of supply.

Whatever degree of success we may have in getting supplies of rubber, much permanent good can grow out of current developments. It is part of the Good Neighbor Policy to help the other American Republics develop their natural resources. The result will be a better standard of living and a more favorable trade relationship for all of us. Guayule rubber production will provide a supplementary source of income during the war emergency in certain areas of our own Southwest. Synthetic rubbers, though costly, are needed badly for certain uses; and the present emergency will undoubtedly hasten their adoption by industry.

Through extra effort we can stretch our rubber supplies to keep 'em rolling and keep 'em flying.

Farm Machinery in 1942

Condensed from Farm Journal and Farmer's Wife

M. Glen Kirkpatrick

FARM equipment will be a short crop in 1942. If you want to check on that, tell your dealer you want a new side delivery rake in May; ask him if he can promise it, and what the price will be.

A farmer in Wisconsin told me in October he had done just that. The dealer threw up his hands. When the farmer left he had given the dealer an order like this: "One side delivery rake whenever I can get it for whatever the price is when the rake is delivered."

In Iowa, a farmer told me he had attended a sale where a side delivery rake used several years sold within $2 of the price of a new one. In Missouri, a mower that cost $14 six years ago sold for $20; a binder bought for $20 four years ago brought $39. These prices indicate the desperate need for implements, brought about by labor shortage and increased production goals.

Last summer farm equipment was given a priority rating of B-1 for new goods, a higher rating for repairs. That B-1 rating didn't look like much because of ten higher ratings. Then the U. S. Department of Agriculture, afraid the increased production goals would not be reached, asked that the priority plan be discarded, and that raw materials be allocated in amounts needed to guarantee essential equipment. Washington decided to try it.

State and county defense boards were told to ask farmers how much equipment they bought in 1940 and 1941, and how much they would need in 1942. The replies indicated that the 1942 output should be not less than 107% of 1940. The SPAB had a lower figure in mind —80% of the 1940 output, for the year ending July 1, 1942. It looks now as if the year might begin November 1, 1941, and the 80% figure stick for new implements with repairs 150% of 1940. Manufacturers say they have operated this year on a basis of 150% of 1940, and couldn't fill all orders, and that the 80% figure really amounts to something like 50% of the 1940 output.

Allocation figures for different implements have not been announced — probably won't be. There may be a compromise

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plan, part priority and part allocation, with an A rating of some kind for machinery. If allocation is based on the assumption that the function of machinery is to replace labor, then we should expect plenty of implements such as combines, corn pickers, milking machines, pick-up balers and the like; fewer plows, harrows, grain drills, etc.

The trouble with that theory is that it doesn't take into account such things as baling wire, fencing, nails, steel sheets for roofing, and other essentials.

New implements? Not many in 1942—that is, not in large numbers. One manufacturer was ready to unveil a new farm machine at the National Cornhusking Contest in November, but the man in charge of the exhibit got orders to pack it up and send it back. Some implements will not be manufactured in 1942. One manufacturer plans to cut out disk plows, another will cut out one-horse cultivators, and other manufacturers will probably quit making implements sold only now and then.

Prices? Any changes will be upward. Some manufacturers have already made some increases. In a time of rising prices how can farm equipment escape? A shortage results in bidding up. Buyers with cash in hand will have first chance. Dealers don't sell on time because they like to.

Trade-ins won't be much of a dealer problem. If an implement has any use left in it, it will bring a good cash price. If it is hopelessly out of condition, it will bring a good price as scrap iron. If all farm scrap iron could be turned back into farm equipment it would help a lot.

How will farmers manage? The best they can, by fitting farm operations to machinery and labor available. They will use their machinery longer days—nights if necessary. Without any urging from defense boards, they will repair old implements if they can't get needed new ones. A big question is whether they will be able to get spot repairs made in local shops which are already short of materials. In California, whose farmers pride themselves that they use more machinery than farmers anywhere else, some small machine shops that built special farm implements have had to close down.

Here and there farmers will adapt implements to do jobs they were never intended to do (and maybe give the manufacturers an answer to a problem they have not been able to solve). What's being done along this line could be a feature article in itself. A few samples:

In California many old autos are rebuilt in local shops for power mowers. In Kansas and Nebraska old autos are used for

motorized hay rakes. In New York old autos are used for "doodlebugs" (homemade tractors). In South Dakota old binders are used for windrowers ahead of the combine. In Oregon old corn binders are used to harvest sugar beet seed. In Illinois side delivery rakes harvest onions. In Tennessee old hay rakes pick stones. In the Grasshopper Belt discarded rear ends of autos are used to make bait spreaders; elsewhere, to make lime and fertilizer spreaders. In Michigan old auto chassis are used for low-down farm wagons.

This situation may be just the one in which farm power contracting will take root and grow —if the custom operator can get equipment and capable help to operate.

One-Man Spraying

Fruit growers short of help can take a tip from F. H. Morse and Son, Oxford county, Maine, who use a one-man spray rig in their 1,800-tree apple orchard.

A 500 - gallon tractor - drawn sprayer is mounted on a two-wheel trailer. Spray pump is run by a heavy-duty power take-off. The tractor has two transmissions, so that several slow speeds permit the operator to do a thorough job without starting or stopping; bigger trees, slower speed; smaller trees, faster speed.

A swivel mounting on the tractor carries the spray gun about six feet higher than the driver's head. The swivel makes it possible to spray three sides of a tree as the rig goes by. One man drives the tractor and works the spray gun.

No experiment is this Morse rig. It has been used for several years with good results. Spraying is done mostly at night or early in the morning.

—Farm Journal

The Most from a Gallon of Gas

Condensed from Successful Farming

C. N. Hinkle

EFFICIENTLY operated, the later model tractors of today will develop about twelve horsepower for an hour on a gallon of fuel. Compared with nine horses for the older tractors, this is a considerable fuel saving. It is just like adding another three-horse team without having to use any more feed.

Many tractor operators, however, fail to take full advantage of the improvements in fuel economy. They waste petroleum products (and in this emergency that's serious), principally because they don't keep their tractors in good shape or operate them properly under all conditions.

One of the most common mistakes made by those who operate an internal combustion engine is that of starting a cold engine and putting it under load before it has had a chance to warm up fully. This results in a high rate of wear during the warm-up period, and in tractor operation encourages the use of a rich carburetor adjustment. (A rich adjustment is necessary so that the cold engine will not stall when the load is applied and is too seldom changed even after the tractor reaches proper operating temperatures.)

Operators should not tinker with their carburetors continually, but it *is* necessary to adjust them for the fuel being used and the load conditions encountered. Before making adjustments one should always read the detailed instructions in the operator's manual. Always make sure, too, that the tractor engine is up to operating temperature before attempting to adjust.

The two most common methods for making carburetor adjustments are: (1) to have the tractor under load or (2) to have it running at full speed with no load, and with spark retarded if possible. In either case, screw the high-speed or load needle value adjustment until the engine begins to lose power because the mixture is becoming too lean. Then slowly open needle valve until the engine picks up speed and runs smoothly. When making this adjustment with the engine running at full speed without load, it is often necessary again to open the needle valve a little, not over one-eighth turn per trial, if the tractor tends to stall when the load is applied.

Reprinted by permission from Successful Farming, Des Moines, Iowa, Jan., 1942

Working a tractor with too lean a carburetor mixture causes loss of power and high exhaust valve temperatures and often results in exhaust-valve burning.

Carburetors on tractor engines have no accelerating pump such as is used on automobile engines; consequently, they should not be expected to have the same throttle response, when speeded up, as passenger cars have. When pulling a power take-off machine, such as the combine or field-ensilage cutter, it is often necessary to use a slightly richer carburetor adjustment so as to obtain a more responsive pickup when sudden loads are encountered. On most tractor carburetors a partial vacuum is maintained in the float chamber when the engine is running at one-fourth to three-fourths load. This suction on the float chamber is necessary for proper operation, and it is very important that all carburetor gaskets be kept tight.

If the tractor engine dies when idling, check the idle stop screw which is used to prevent the throttle valve from closing completely. A turn or so of this screw will give a higher idling speed and often prevent the engine from dying when idling. The idle needle valve should also be adjusted at idling speed. Heat for vaporizing the incoming fuel is obtained from the exhaust manifold; accordingly, when heavier fuels are used the engine must be set to idle faster to provide sufficient heat for vaporizing.

To obtain best economy, all internal combustion engines must be kept in good shape. On a tractor the magneto should be checked every 200 to 300 hours to make sure that the points are properly adjusted and not pitted. The magneto points will need to be replaced, and the magneto should be checked by a reliable serviceman to see that the magnets are fully charged and that a hot spark is being produced. Spark plugs and spark plug wires need replacing. When replacing plugs, do not buy a plug just to fit a hole. Buy a good plug of the heat range recommended for your engine. Cold-type spark plugs should be used when burning gasoline only. Hot-type spark plugs should be used when burning heavier fuels. The manifold heat adjustment should be properly set for the fuel being used, and this adjustment should be in the hot position, or set to give a muffled exhaust sound when using tractor fuel, and in the cold position when using gasoline. When burning gasoline only, the tin shield on the intake manifold should be removed. To prevent excessive engine wear, the air cleaner must be serviced regularly.

When storing the tractor between seasons, protect it by giv-

ing it a thoro oiling and greasing. Always drain and refill the crankcase before storing. Gasoline will evaporate, and often when a large surface of gasoline is exposed to the metal in a tank and evaporates, deposits are formed in the fuel tank and line. These deposits can only be removed by dissolving with acetone or a 50-50 mixture of alcohol-benzol. Such trouble can be prevented by draining the fuel tank, carburetor, and line, and leaving the carburetor drain plug open. Stale or partially evaporated gasoline often results in stuck valves.

Tractors are being used more and more each year during the cold winter months. This kind of service presents a problem which calls for special care, for water sludging is commonly encountered in light-load operation. Much of the water comes from combustion, since each time a gallon of fuel is burned a little over a gallon of water is formed. If proper operating temperatures are not maintained, some of this moisture will find its way into the crankcase, condense, and form water sludge. To guard against water sludging, always warm up the tractor quickly and maintain proper operating temperatures at all times. When a tractor engine is operated in cold weather, the crankcase oil should be drained more frequently and the oil filter serviced and cleaned more regularly. If changing of the oil and servicing the filter are neglected, the intake screen on the oil pump soon becomes plugged with ice particles or water sludge, and the oil flow to the bearings is shut off. This is a common cause of burned-out bearings. Also, excessive moisture in the crankcase often causes stuck piston rings, burned valves, corroded valve stems, and scored cylinder walls. Water sludges cannot be prevented by motor oil formulas; however, the more stable, highly refined lubricants will be found to give the greatest resistance to oil deterioration and water sludging.

Varnish formation due to oil deterioration constitutes one of the most troublesome problems now confronting the oil industry, engine builders, and engine operators. This has been a major subject for discussion at many of the automotive engineers' meetings of the past several years, but to date it has not become a major problem for the tractor operator. With trends in engine design along the same lines as those in the automotive industry, it is reasonable to expect that such troubles might become more common.

One of the most common ways of forming varnish in a tractor engine is that of driving up to the end of the field and turning off the switch on a hot engine before the pistons have a chance to

cool down. The oil film between the hot piston and the cylinder wall will stew and form varnish. When the engine is again started, this thin, varnish-like film is scraped into the lubricating oil and is often carried by the oil to the oil filter. On some of the older brass filter elements this coating will cover the fine wires and cause the oil filter element to become partially plugged. If a filter *is* partially plugged, it will be noted that it fills up more rapidly and needs to be cleaned more often to keep it working. To clean a varnished metal filter element thoroly, a solvent such as a strong solution of lye water or acetone must be used, and when such solutions are employed, the filter should be well flushed so as to remove any foreign material which might become loosened and remain inside of the filter element.

New developments in oil manufacturing processes and the use of additives which have inhibiting and detergent action have been found to be very beneficial in overcoming some of the more common operating problems of heavy duty service. Detergents are used to keep the engine clean. By their action, carbon and oil-soluble particles formed from combustion and oil oxidation are prevented from accumulating in deposit by being kept in suspension. In other words, the detergent keeps the particles from gathering into large masses, and likewise prevents adherence of the soot and sludge to the internal parts of the engine. With oils of this type, the oil filters stay clean longer, and if the oil is drained regularly it will be found that the engine also stays clean. The color of the oil cannot be used as an indication of oil condition, for oils of the detergent type naturally become discolored very quickly. Extensive engine tests show that, contrary to what might be expected, the better types of detergent oils have an exceptionally low rate of wear.

For determining the actual improvements which have been made in lubricating oils it has been found that the long-drawn-out, costly process of engine tests is the most reliable method. So far no short-cut method is known for determining how good an oil really is. A problem the engineers are trying to solve today is that of standardizing engine tests for oil evaluation. With the new oils containing additives, it is very important that they be used as supplied by the manufacturer and not mixed with special additives that are supposed to improve lubrication.

Finally, to obtain maximum life and service from the farm tractor, keep the tractor adjusted and in good mechanical condition. It will save fuel and repairs.

A Cutting Horse Must Be "Good"

Condensed from The Cattleman

Frank Reeves

IN the cowboy's string there are drive horses and roping horses and day horses, all of which generally are known as cow-horses. But of all the horses that have commanded his care and affection, that have fired his imagination and loosened his laconic tongue, cutting horses are in the lead."

A cutting horse is the result of training and not breeding. He represents no particular breed or combination of bloodlines. There is no dominating color and he does not conform to any particular standard of conformation. Frequently he is not the most attractive horse on the ranch, but a good cutting horse ranks second to none in money value. He is the pride and joy of the ranch boss and the boast of every cowboy on the ranch.

A cutting horse earns his name because of his ability to out maneuver and drive any particular animal from the herd that his rider selects. To do this he must know a lot and be able to do many things the average horse never learns. It is little wonder good cutting horses are scarce.

Since cutting horses are *made* they do not all fit into the same pattern. There are certain things that a good cutting horse must do and certain things that he must not do, but in his performance he may do it differently from another horse and still be known as a good cutting horse. Cutting horses, like baseball pitchers, are known as *good* if they get results.

Many cow horses possess all the physical qualifications needed to make a good cutting horse, a reasonable amount of speed, the ability to start and stop quickly, or be able to turn quickly either to the right or left. Ranchmen sometimes describe the turning ability of a horse by saying he can turn on a dime and give you back a nickle in change.

Ranchmen will tell you that a lack of proper mental balance rather than mental capacity is the big handicap in making a cutting horse. A good horseman can teach the average horse to do most anything, but when he goes to make a cutting horse out of the average ranch horse that is something different, so different that experienced ranchmen realize the futility of trying. The horse will acquire a certain

Reprinted by permission from The Cattleman

amount of the qualifications that a good cutting horse must have, but the finer points that earn for him the designation of a top cutting horse, that intangible something that will cause a ranchman to thrill as he watches the horse work, will be lacking.

Ranchmen frequently use the term "cow sense" when they attempt to describe the mental qualifications of a good cutting horse. If you press them for an explanation of what constitutes "cow sense" in a horse they will explain that a good cutting horse knows just what the cow-brute being driven from the herd is going to do and be able to counter it. In other words get the job done.

There is a third qualification to be known as a good cutting horse. It might be considered part of the mental balance or it might be described as temperament. It is recognized as a cardinal sin to chouse the herd, excite the animals while removing certain classes or groups of animals. Here cowmen differ on just how a horse should perform. One group approves of a horse that is eager, alert and on his toes when driving an animal from the herd if he will settle down the instant the animal has been driven the proper distance toward the place where the "cut" is held and returns to the main herd in a fast walk or a slow trot. This enables the horse to get his breath, conserve his strength and not excite the cattle when he re-enters the herd where his rider will select another animal to be removed.

The other group of cattlemen insist that a good cow-horse should seldom get in a hurry, that he must outguess the cow-brute and execute a counter movement in a quiet manner before the animal being removed from the herd can make a move other than toward the outside of the herd and then on toward the cut. This type of cutting horse is not nearly so spectacular in his work as the eager and alert horse.

Two men who have ridden a number of outstanding cutting horses and know how one should perform and how to ride one, were discussing these two types of cutting horses. Otto Jones, manager of the *Spade* ranch, with his headquarters on the Renderbrook division near Colorado City, defended the alert type of cutting horse by saying he knows he is better than the animal he is following and is willing to dare the cow-brute to do anything but leave the herd. Jot Smyth, of Lubbock, argued for the quiet type of a horse and named some of the good ones he has used in the years he has been working cattle. Jones has been working for the *Spade* ranch for thirty-four years and Smyth can claim a few more years work as a cow-

boy than Jones' stay with the *Spades*.

The best way to judge whether a horse has the makings of a cutting horse is the way he feels under the saddle when you ride him into a herd, Jones says.

Smyth was very positive that you will never see a top cutting horse that fails to watch the animal very closely while it is being driven from the herd, and usually the horse will have his ears thrown forward while working, he added.

Some horses work with a loose rein and others work with a tight rein. The fact that a horse works with a tight rein does not necessarily mean that he fails to watch the animal.

There is a class of cutting horses that are frequently described as reining horses. Most real cowmen insist they are not cutting horses. Some of them have wonderful action and respond instantly to the slightest pressure on the bridle rein by the rider. Their effectiveness is in direct proportion to the understanding that exists between the horse and rider and what the rider knows about cutting cattle and is able to transmit to the horse. The work of this type of horse is never as spectacular and thrilling as the horse that never takes his eye from the animal and counters every move the animal makes.

In recent years managers of some of the major rodeos have included a class for cutting horses. This event is always very popular with cattlemen and people who know what a cutting horse should do. Usually the best horse wins, but luck is a big factor where each horse has such a short time to show what he knows and how he can do it. The action of the animal being driven from the herd can make or break a horse in this kind of a contest. In order to get more action some of the contestants will have a coworker that will turn the animal back. Naturally this is very confusing to the horse trying to drive the animal from the herd since it is something that never happens during regular ranch work. It bothers some horses more than it does others.

The twenty-one horses entered in the cutting horse contest at the Texas Cowboy Reunion at Stamford this year were considered a good showing of cutting horses. The winner in this contest was a King ranch mare, Catarina, and ridden by L. F. Cavazos. She had wonderful action and was one of the winners in the Quarter horse show at Stamford, second annual official show for the association.

It goes without saying that it takes a good rider to show a horse to advantage. Not only must the man be able to ride but

he must know what to expect a horse to do and not throw him off balance.

Since it takes work and experience to make a good cutting horse, it is easy to understand why there are not as many good cutting horses as there once were to be found in the range country. The passing of the open range and the introduction of corrals and cutting gates have eliminated much of the work that was once done on horses, and this was the work that made top cutting horses that men like to remember and talk about. Men who can appreciate a good cutting horse will always like to hear them talked about.

Push Button Barn Cleaning

Condensed from Capper's Farmer

Carlton Stoddard

WITH due respect to the milking machine, it still takes a strong back and a pair of boots to make a good dairyman. Anyone who has ever manipulated the business end of a manure scoop can tell you that.

Cleaning the barn twice a day probably has done as much to drive farm boys to the city as any one thing.

Ten years ago, William Boldt, a Wisconsin dairyman with a bent for mechanics, hit on an idea for eliminating all handling of manure by hand. His herd of thirty-one Holstein cows, producing a ton and a half of manure daily, gave impetus to the idea. If a machine can be made ingenious enough to duplicate the human hand in milking, why not a machine to clean the barn? A grain elevator, auto rear axle, log chain, motors, sprockets . . . all were fragments of the idea that pieced together in his mind.

One night he announced at the supper table, "Boys, I've got an idea for a barn cleaner!" There were no objections from the boys. They not only stayed on the farm, but put their wits to work for the next ten years helping perfect the Boldt Automatic Barn Cleaner.

The first barn cleaner was a trial to the patience of the Holsteins, but even the cows contributed experimental data. The Boldts kept an accurate check on the weight of manure produced by each cow. The average was 110 pounds every twenty-four hours. No wonder it felt heavy on the scoop shovel!

Multiplying 110 by the total number of cows in the barn, they found that 3,400 pounds accumulated every day. Over 1½ tons

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that must be moved along the gutter. Thus was determined the amount of power required to run the cleaner, and the tensile strength of conveyor chains. The Boldts decided their machine must be capable of moving five to six tons maximum.

The problem of power arose. The auto axle was torn out and a truck axle installed to increase the gear ratio, slowing down the speed of the conveyor.

Then one day William Boldt called his seven-year-old daughter Lois and ordered her to clean the barn! Lois proudly threw the switch. The slatted conveyor moved up one gutter and down the other emptying every scrap of refuse and liquid manure into the outside conveyor, taking it high up and away from the barn. In seven minutes the barn was clean.

The barn cleaner worked. But the job of making it practical for installation in many different types of barns still had to be done. It wasn't an easy one.

The Holsteins contributed their part with monthly milk checks up to $800. The money bought new lathes and drills for a machine shop . . . new jigs for cutting gears . . . new patterns for a foundry to cast a special log chain sprocket. Finally . . . it paid attorneys and the U. S. government for a patent.

The first year over 300 farmers visited the Boldt farm to see the automatic cleaner work and inquire when it would be on the market.

But the Boldts weren't satisfied. They wanted to test it in other barns besides their own. Another dairyman who was interested in their problems was E. A. Gengler, inventor of the electric fence. He volunteered his modern dairy barn for an experimental installation. After observing the cleaner operate for a few weeks, Gengler mailed a check to the Boldts to pay for it.

Wilfred S. Baas, Waukesha county, Wisconsin, considers his dairy barn up to date, now that he has installed an automatic cleaner. It cleans his 18-stanchion barn in 4¾ minutes, where it took an hour of hard shoveling before.

"It has reduced the bacteria count in my milk enough to qualify for Grade A," he said. "The cleaner takes all the manure out without spilling any on the walk."

Orie Strawbridge manages the Schuster Dairy, Waukesha county, where an automatic cleaner has been operating nine years. "The cleaner paid for itself long ago in man-hours saved," he said.

Strawbridge brought out the fact that the cleaner loads directly into a manure spreader or builds one high, cone-shaped pile

instead of a long pile as with a litter carrier. "Our cleaner has put thirty-five tons into one pile, which never freezes," he said.

Another advantage observed was that the conveyor slats acted as cleats to prevent cows from slipping into the gutter. The Boldts recommended cleaning twice daily. The machine removes manure quietly without odorizing the air as when shoveled by hand. Cows in the stanchion pay no attention to it. They may be taken out after the barn is cleaned, doing away with tracking up the walk. Cleaning may be done without opening the doors and cooling off the barn in cold weather.

Selective Registration

Systems of selective registration have been in operation for years in Holland, Denmark, and the Channel Islands. However, the first breed association in America to adopt a strict selective registration program is The American Jersey Cattle Club. Beginning January 1, 1942, only sires carrying specified proof of production superiority will be granted registration.

Jersey sires, to qualify in the future, must be sons of bulls proved to transmit at least 400 pounds butterfat, or be by a tested sire whose daughters average above 500 pounds fat, or be by a "Star Bull," so designated by the Jersey Breed, or be from a dam with at least a 400-pound fat record. Special cases may be granted the right of registration upon satisfactory proof presented to the Cattle Club Board.

The selective registration program is a direct, forthright attack by the Jersey Breed Association on the problem of offering to the dairy farmer a sire with more promise of delivering good-producing daughters, and more worthy of the name "Registered." It answers the criticism that the registration certificate by itself is not a guarantee of excellence, but is merely an accurate recording of the parents, a party to the mating, and a certificate of date of birth.

The move is not one of complete surprise to the Jersey breeder. It was adopted back in June, 1939. Since that time breeders have been quietly mass-testing their herds at the rate of more than 35,000 cows per year. This courageous step by the first association to register dairy cattle in America marks their second great pioneering milestone of progress as a contribution to the dairy world.—*Jack Nisbet, Director, Extension Service*

—Successful Farming

Agriculture Goes Abroad

Prepared for publication in "Farmers Digest" at the request of the editor

John L. Stewart

Assistant Chief, Division of Foreign Agricultural Research

THE Department of Agriculture has always been mindful of the very considerable influences exerted upon American farmers by events in other countries. Since the first World War, the Department has maintained a special unit whose chief responsibility is to keep American farmers informed with respect to changes in foreign agricultural supplies and requirements.

The Office of Foreign Agricultural Relations represents the latest phase in the evolution of the Department's interest in foreign affairs. Created on January 1, 1939, as a separate unit in the Department, OFAR had as its immediate ancestor the Foreign Agricultural Service in the Office of the Secretary. Prior to December, 1938, the Foreign Agricultural Service was a division in the Bureau of Agricultural Economics. This division was created in June, 1930, by the act of Congress establishing a separate foreign service for agriculture.

The functions of the Office of Foreign Agricultural Relations differ from those of its predecessor organizations primarily in the broadening of the responsibilities for co-ordinating all lines of work relating to foreign trade within the Department of Agriculture. They also include the responsibility for liaison with the consolidated Foreign Service of the United States. On establishing the OFAR, the Secretary of Agriculture prescribed the following specific functions:

1. To collect information on foreign agricultural production, foreign markets, foreign trade, and related matters, through the Foreign Service of the United States, the International Institute of Agriculture, and other appropriate sources, and to disseminate such information to all branches of the Department interested and to the public.

2. To maintain liaison with the Department of State with a view to assuring prompt and adequate reports from the Foreign Service of the United States on foreign developments of interest to the various branches of the

Department of Agriculture and to American agriculture generally.

3. To conduct specialized research and investigational work on foreign demand for American agricultural products, including such related subjects as the trends and potentialities of competitive foreign agricultural production, the nature and tendencies of foreign governmental policies affecting agricultural production and consumption and the general economic and financial conditions in foreign countries as they affect the demand for agricultural products.

4. To direct and co-ordinate the participation by the Department of Agriculture in the reciprocal trade agreements program.

5. To plan, direct, and co-ordinate the participation by the Department of Agriculture in the general program of co-operation between the Government of the United States and the governments of the other American republics under the terms of acts of Congress authorizing such co-operation.

The foregoing specifications utilize a background of experience which places the Office of Foreign Agricultural Relations in a singularly strong position for dealing with the current war developments as they affect our agricultural foreign trade. In addition to its fundamental responsibility as a gatherer and disseminator of foreign information, OFAR has four major fields of activity which are concerned with the immediate emergency situation: (a) Co-operation with other Government agencies in making available United States agricultural products for export under the lease-lend program; (b) representing the interests of agriculture in reciprocal trade agreements program; (c) coordinating the work of other agencies of the Department of Agriculture in developing non-competitive agricultural products in the other American republics; (d) representing the United States in the formulation of international commodity agreements.

The Lease-lend Program

Political and military developments of the last two years have resulted in the disappearance of a large fraction of the former export market for American agricultural products. By far the greater part of the current export movement is represented by commitments to supply Great Britain and her allies with agricultural products under the lease-lend program. The work of OFAR in this field is not only of considerable significance in the current defense program but also may be regarded as the channel whereby a contribution may be made to the rebuilding of agricul-

tural export outlets in the post-war reconstruction period.

Reciprocal Trade Agreements

Since the passage of the Trade Agreements Act in 1934, the Department of Agriculture has played a prominent part in carrying out the trade agreements program. The Office of Foreign Agricultural Relations and its predecessor organizations have supplied the personnel representing the Department on the various committees engaged in the details of preparing for and negotiating the agreements. In spite of the bad effects of the war on international trade in general, there is reason to believe that, had there been no trade agreements program, the foreign outlet for the products of the American farm today would be even smaller than it is. Furthermore, the concessions secured for American industrial products under the trade agreements program represent a substantial contribution to the power of the American industrial community to buy American farm products. Fortunately there still remain a number of countries whose commercial policies are sufficiently in keeping with that of the United States to warrant a continuation of the trade agreements program. The Department of Agriculture may be counted upon to do all in its power in the efforts of the United States to develop mutually helpful relations with such countries through the enlargement of our international trade.

Inter-American Co-operation

In directing the Department's participation in this Government's program of co-operation with the other American republics, the Office of Foreign Agricultural Relations has proceeded upon the generally accepted basis that improved relations with our southern neighbors depend very materially upon increased volume of inter-American trade. Sales to these countries depend upon their ability to buy, and their buying power is represented chiefly by the agricultural products they have for export. The OFAR has played a leading part in the efforts of the Department of Agriculture to encourage the production in and exporting from the other American republics of agricultural products that are not competitive with our own.

Much publicity has been given the steps taken to increase the production of rubber in the Western Hemisphere. It will be recalled that formerly Brazil was the world's chief source of this very vital commodity. It is anticipated that a satisfactory rubber industry can be built up in tropical America, thus making it unnecessary for the United States to depend upon rubber originating in more remote producing areas. Other tropical products, in-

cluding plants important as sources of insecticides and medicines, are receiving their share of attention. There is reason to believe that by this means the movement of American agricultural export products to those countries can be increased. It is more important, however, to remember that the other American republics represent a considerable outlet for United States industrial products, and that, after all, our industrial workers constitute the chief market for the products of our farms.

International Commodity Agreements

Activities of the Office of Foreign Agricultural Relations in the field of international commodity agreements may well be considerably increased in the near future. It is well recognized that several of the world's great agricultural export commodities such as wheat and cotton are faced with the serious problem of reconciling well-maintained export supplies with a materially contracted export outlet. In the case of wheat, efforts are now being made to apportion among the exporting countries equitable shares of the existing overseas markets without losing sight of the possibility of expanding that export outlet beyond its current much reduced size. The International Coffee Agreement represents an example of what may be accomplished in the field of international commodity agreements. Under our leadership, all of the coffee-producing countries of the Western Hemisphere were allotted shares in the coffee market of the United States, their chief customer. While the results gained with respect to coffee are in somewhat reverse position as against those being sought with respect to wheat, the Coffee Agreement is an outstanding example of what can be accomplished in this field.

Opportunities in Drug Plants

Condensed from The Michigan Farmer

C. E. Wildon

FOR many years drug firms in this country have depended on European sources for many of the plants commonly required in the production of certain drugs. Such plants as Belladona, Digitalis, Hyoscyamus (Henbane), Angelica, Chamomile, and Horehound have commonly been imported mostly from European countries. For instance, the annual importation of Digitalis amounts to about 50,000 pounds, normally valued at about twenty-five cents a pound. This importation is the equivalent to the production of 500 acres.

During the first World War these plant products became difficult to obtain and in many cases the plants were grown in this country. Now again, apparently we are facing a shortage of some of these products as the result of war and non-production in Europe. Some of these products have already advanced considerably in price as for instance, Digitalis which was quoted last spring at $5 per pound.

There is always the possibility that overplanting of any of these crops will depress the market for them. Anyone who contemplates the growing of these crops should first investigate the possibility of marketing the products. The first step should be to contact drug manufacturers to determine this.

While few of these crops have ever been grown commercially in this country, many of them have been grown successfully as garden plants. The culture of these plants is not difficult and it should not be at all difficult for the experienced farmer to apply commercial methods. Some drug plants have climatic requirements that make it inadvisable to attempt their culture on any other than an experimental basis.

A few of the more important drug plants that seem to offer possibilities to farmers are Digitalis, Angelica, Henbane, Horehound, and Chamomile.

Foxglove, DIGITALIS PURPUREA, is commonly obtained from England, Germany, and Austria. Leaves of the second year growth are collected, dried, and used by drug firms.

Foxglove thrives in a well-drained sandy loam containing liberal quantities of organic matter, but will do well in heavier soil. Good soil drainage is, however, essential. The seed may be sown in early spring at the rate

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of about two pounds per acre. It should be grown in rows three feet apart and about fifteen inches apart in the rows. Barely cover the seed. An average of 500 pounds of the dried leaves may be produced per acre. The dried leaves must be kept in barrels or other closed containers to prevent deterioration.

Angelica, ARCHANGELICA OFFICINALIS, the seeds and dried roots are used by drug firms. Commonly obtained from Germany. Requires rich loam, moist, but well-drained. Readily propagated by division of the roots or from seed started in early spring in a hot bed. It may also be sowed in the fall. The plants should stand two feet apart. The plants may be harvested in the fall of the first year or the second year.

Henbane, HYOSCYAMUS NIGER, is a medicinal herb. It is often naturalized, growing wild or as a weed in poor or sandy soil. There are both annual and biennial forms. The biennial is the one cultivated for its leaves, although the annual form is grown in Germany and Russia. The annual form, however, produces a lower percentage of the alkaloids. The seed is often rather irregular in germination and may remain in the soil several years before germinating. It should be grown in gravelly or sandy soil. The leaves and flowering tops are gathered in June and July when the plant flowers.

Marrubium vulgare, HOREHOUND, is a perennial, but can be grown as an annual. Sow seed in early spring in rows two feet apart. Later thin to six inches apart in the rows. The crop is harvested throughout the summer. The branches are cut off at flowering or just previous to flowering. The leaves are then stripped off and dried. It is largely imported from southern France.

Anthemis nobilis, ROMAN CHAMOMILE, is a hardy perennial commonly found as an escape or as a weed. The flowers are used medicinally. The crop of flowers is cut in July to Sept.

The double flowered form is commonly grown in Europe. It thrives in a rich, light, sandy or gravelly soil although one specialist recommends growing it on dampish stiff black loam. Seeds may be sown in early spring (April) in rows two to two and one-half feet apart. Thin plants to stand ten to eighteen inches apart. They are more commonly propagated by division in the early spring.

The flowers are picked by hand, selecting half-open to full-open flowers. They must be dried quickly in heated drying rooms, although in warm dry weather they may be satisfactorily dried in open drying sheds. A crop of about 400 pounds per acre is usual.

Cow Housing Experiment

Condensed from The Farmer

TRADITION and common usage in this northern climate have decreed that dairy cows should be closely confined and warmly housed during the winter months. As a result, the best dairy barns today are very substantially constructed, with the special idea of providing warm quarters for the cattle, and therefore a proportionately large amount of the capital invested in the farm is in the dairy barn. The result is high overhead cost.

Even though experience points to the fact that warm winter quarters are necessary for dairy cattle, investigators at the University of Wisconsin must have some doubt about the matter, because they are setting up an experiment that ought to answer the question without leaving room for any doubt.

Thirty young cows, mostly three-year-old heifers of common inheritance, are being used in this experiment. They have been divided into lots of fifteen each, care being taken to make the two groups as uniform as possible. One group is being kept in a heavily insulated and solidly constructed barn that is as warm as a structure may be made without artificial heat.

The other group is being kept in an open-shed type of barn without stanchions. They may come in or go outside as they please and will be confined only during milking time. The milking compartment, adjoining the open-shed quarters, is warmly built and contains four stalls.

Both lots will receive the same kind of feed, but quantities will probably be varied as conditions may seem to require. During the spring, summer and fall months both lots will go to pasture just as they would under normal farm conditions. The same crew will handle both lots.

The experiment will run for a period of five years. It is planned to alternate the groups each year; that is, the group kept in the open shelter this winter will be put into the stanchion barn next winter and the stanchioned group of this winter will go into the open shed next winter and so on.

Records of production, feed, labor and general performance will be kept on the two groups. Progress reports will be made from year to year and a final report published at the end of the five-year period.

An entirely new set of steel buildings has been constructed to

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house the experiment. The buildings are the gift of the Carnegie-Illinois Steel Corporation to the University of Wisconsin.

The building proper is a one-story structure consisting of two wings, one of which is enclosed and insulated and the other open and uninsulated. Adjoining are a haykeeper for chopped hay, a silo, a hay barn and milk room.

The type of building material used has no significance so far as the immediate question of warm or cold shelter for dairy cattle is concerned. The Carnegie-Illinois Steel Corporation made the grant of the buildings in order that a scientific study might be made of the use of one-story steel dairy barns. The University on its part is interested in studying the possibilities of the savings in space which are afforded by eliminating mow space for loose hay and storing hay as silage in a silo and chopped hay in haykeepers.

New Grass Seeder

There is a new grass seeder attachment for a cultipacker.

The seeder box is very much like the one usually attached to a drill. It is mounted between the two sections of the cultipacker. As the first section passes over the ground, it makes small grooves or furrows. The seed rattles into these. Then the second section of the cultipacker splits these ridges and covers the seed. The advantage is that the seed is not covered as deeply as it is when it is supplied with a seed box on a drill. The result is a better stand, and there is the distinct possibility that a good stand can be secured with considerably less seed. We have heard this mentioned several times, always with enthusiasm. For example, County Agent Ray Bender, of Essex County, New York, tells how Bert Patterson, of Willsboro, used this method and liked it.

—*American Agriculturist*

Chickens Have a Social Organization

Condensed from American Poultry Journal

Prof. A. M. Guhl
University of Chicago

BIOLOGISTS have become very much interested in the social organization found in several classes of backboned animals. Birds have been given much study in this regard, and chickens have been very useful laboratory animals for experimentation. This social or peck-order is based on the pecks given and received by the individuals, in which the social position of each is determined by the number of birds it pecks. The truly dominant bird pecks all in its flock, and the bottom bird in the order typically pecks none and is pecked by all; the rest may form a straight-line peck-order between them, although pecking-triangles may occur.

Peck-Order Is Relatively Stable

The nature of this hierarchy has been given much experimental attention by and under the direction of Dr. W. C. Allee at the University of Chicago. The studies made and in progress are various and become quite complex. The information given here is derived from small flocks of White Leghorn chickens housed in pens 14½ x 4½ x8 ft. high. What factors make for social success or social level in a flock? What physiological and psychological aspects are there, if any? What is the significance of a social order in chickens?

The peck-order in flocks of mature hens is relatively stable, in pullets it is more unstable or formative, while in groups of cocks, the order may tend to change. In mixed flocks, all of the cocks dominate all of the hens. When strange birds are brought together, fights occur between all of the individuals, until a decision is reached, or there may be passive submission; upon the outcome of these encounters, the social order is based. A beaten bird will thereafter avoid any individual to whom it lost in the introductory contest. Back pecks and reversals are rare among hens. Peck-orders become less regular as the number in the group is increased, probably due to the limitation of the birds in remembering so many individuals.

The intensity of the peck

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varies: blood may be drawn from the comb, feathers may be plucked. On the other hand, the peck may be undelivered and constitutes a threat. The blow is usually directed at the head. Pecks are given most frequently at feeding time, and are rarely given when roosting.

What It Takes to Dominate

By fighting strange hens in pairs, it was found that several factors are involved in social success. If one bird acts as though intimidated by the appearance of an apparently unfrightened individual, it may give way without fighting. If both act as though frightened, the one that recovers more rapidly wins. Other things being equal, the stronger bird usually wins. Mature hens dominate immature chickens. A tired, ill, or severely molting bird may lose, although it was otherwise normally aggressive. Birds high in the peck-order of their flocks usually are more successful in these initial pair-contacts than the inferior birds. The hens fight better in their home pens or in the presence of others of their flock. Within the same breed, hens with the larger combs have the better chance of dominating the situation.

Since comb size is influenced by the male sex hormone in the blood, and hens normally produce some of this substance, and since hens are less aggressive than cocks, and capons than normal roosters, a relationship is suggested between aggressiveness and the male sex hormone. Accordingly, testosterone propionate, the male sex hormone, was injected into low-ranking hens. Each so treated rose in social status and one of these eventually occupied the top position in each flock so tested.

These treated hens showed more aggressiveness, their combs increased in size, egg-laying was retarded or suppressed, crowing was initiated, and in three hens some courtship occurred. When the injections ceased, these changes vanished but the higher social position was retained, probably due to memory and social inertia.

Other hormones were tried: epinephrine had no effect on the social position of the hens injected; thyroxin caused severe molting when given in large doses but in relatively small amounts it had no noticeable influence on success in initial pair-contacts. The female sex hormone, estradiol, did not produce as striking results as the male sex hormone, but tended to act, probably indirectly, in the opposite direction.

When one observes small flocks of chickens for long and continuous periods, he becomes impressed by the individuality

of the members of the flock; he may quite readily recognize the individuals by physical and behavioristic differences. These individual differences have also become apparent in the data recorded. Some birds peck harder and more readily than others; some do not react strongly when pecked, while others may show degrees of frustration in the presence of certain of their superiors.

Antipathies and tolerations are relatively common between some individuals within the flock. These peculiarities are not necessarily related to the position in the peck-order of the individuals concerned. That the flockmates recognize each other is obvious, and the indications are that head-furnishings play a major role in recognition; when combs were removed surgically from hens, they were attacked as strangers when returned to their pens the second day after the operation. A control was isolated for the same period of time as the dubbed bird and was not attacked when returned to the flock.

When roosters with a known peck-order were placed singly into a pen of hens whose social order was determined, it was found that the frequency of their matings had no relation to their social position, nor were the hens treaded in accordance with their social levels. But when several cocks were left in the relatively small pens of the hens, psychological castration took place. The rooster at the top of the male peck-order would suppress his inferiors sexually by preventing their matings.

This male interaction may be so intense that inferior cocks are not tolerated on the floor of the pen. After some weeks, the inferior cocks learned to ignore the hens of their flock, although they would tread readily when tested singly with hens of another flock.

There is a daily rhythm of sex behavior: the cocks do more courting during the morning and more treading during the late afternoon. In courting, the rooster may merely raise his hackles while extending his head toward the hen, or he may dance in an arc around the hen, lowering and fluttering one wing. If the mate crouches, he may tread; if she darts off, he may direct his attention to another female. There was some indication that the most successful breeding cock usually waits for the hen to squat before mating.

A hen at the top of her social organization has the free run of the pen and exercises her domination at feeding time. Inferior birds wait their turn to feed, unless they happen to be tolerated by the superior. A very non-aggressive hen may not feed until all her superiors have gone to the roost or busy themselves else-

where in the pen. A hard-pecked bird may spend much time on perches or in neutral areas; she avoids superiors in a pronounced manner when they approach. The same remarks may hold for the roosters, but in addition to feeding-rights, the dominant cocks also have treading-rights.

The reader may find interesting implications in such observations according to his particular interests, whether they be biological, sociological, psychological, or whether they apply to the practical problem of poultry husbandry.

Prevention and Control of Calf Scours

Condensed from The Jersey Bulletin

G. C. Holm and D. L. Fourt

University of Idaho

SUCCESSFUL dairying depends, to a large extent, upon raising well-bred calves, especially heifers. Calf scours probably cause the loss of more calves than any other factor. The prevention or control of calf scours is an important problem to every dairyman.

Calf scours is an acute contagious disease affecting the digestive system of very young calves. The infection sometimes spreads to the older calves. It is also known by such names as white scours, white diarrhea of calves, calf diarrhea, and calf dysentery.

Usually the calf becomes listless and refuses to eat. It then develops a fetid, watery diarrhea and the stool may become bloody. Its hair becomes rough, the skin gets dry, and its eyes sink deep into their sockets. The calf may walk rather stiffly; it will eventually get weak and refuse to walk. The tail and rump usually become smeared with fecal matter which may set up a local inflammation causing the hair to slip. The pulse and breathing become rapid and the temperature rises. The temperature may return to normal or become subnormal before death. Some times the infection spreads to the lungs, producing pneumonia.

The disease may appear in the calf at any time from birth to several weeks of age. Ordinarily the symptoms appear within twenty-four to ninety-six hours after birth. Prenatal infections are apparent at birth; however, some calves do not contract the

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disease during the critical period but contract it at an older age from some young infected calf. Occasionally the infection is so severe that the calf dies without showing symptoms or lesions.

The infectious agent of calf scours is an organism called Escherichia coli and is often spoken of as the colon bacillus. This organism is universal in nature and is considered to be a normal inhabitant of the intestinal tract of adult animals. When the organism enters the digestive tract of a young calf it usually spreads to other tissues because the animal does not have enough resistance to control it. As a result, severe digestive and systemic disturbances occur. Occasionally calf scours is produced by organisms other than the colon bacillus. This type of infection is usually more severe than the common calf scours.

The most common manner for the organism to enter the body of the calf is through the mouth. Some of the ways in which the organism may enter the calf's digestive tract are as follows: at birth, especially if the rump and external genitals of the dam are soiled; through sucking contaminated teats; by eating bedding; and from contaminated milk or milk pails.

Another mode of infection occurs before birth. This is called intra-uterine or prenatal infection. Calves infected intra uterine are usually weak at birth, and are sometimes scouring before birth as indicated by discharges on the placentae.

The calf may become infected through the navel stump soon after birth. This mode of infection is the least common of the three, but does occur occasionally.

Predisposing and Contributing Factors

Usually the calf's natural resistance is sufficient to prevent infection unless some predisposing factor weakens the animal. Any condition which weakens the calf, reduces its resistance and makes it an easy victim for one of the calf scours' organisms.

Some of the most important predisposing or contributing factors of calf scours are the following:

1. Overfeeding.
2. Organisms picked up from unsterilized utensils (dirty calf pails).
3. Feeding sour milk at one feeding and sweet milk at the next.
4. Variation in temperature of milk at different feeds.
5. Irregular time of feeding.
6. Feeding fermented food.
7. Feeding high fat milk.
8. Overcrowding.
9. Insanitary calving or maternity pens.
10. Dirty, damp, or wet calf pens.

11. Permitting a draft on the calves.
12. Improper ventilation in calf barn.
13. Cold calf pens.
14. Contaminated teats and genitals of the dam at the time of, or immediately after calving.
15. Colostrum that is low in vitamin A.

Most cases of calf scours can be prevented by controlling the predisposing or contributing factors. Prenatal infection is an exception.

It is far better to underfeed than to overfeed a calf. Overfeeding is one of the leading predisposing factors of calf scours. Six to ten pounds of milk in two feeds daily, depending upon the size and condition of the calf, is sufficient during the first two weeks. The milk should be weighed or measured accurately at each feeding. The calf may not remain fat and sleek, but is more apt to remain healthy on this amount. Small amounts of liquid milk have less tendency to irritate the delicate tissues of the digestive tract.

Another major factor in preventing calf scours is the use of properly sterilized utensils or calf feeding pails. Merely washing calf feeding pails does not kill the germs. It requires hot or boiling water, or preferably steam, or a chemical sterilizing solution. After thoroughly washing in hot water containing a dairy washing powder, all utensils should be sterilized by one of the following methods: (1) exposed for at least fifteen minutes to at least 170 degrees F., or for at least five minutes to at least 200 degrees F. in a steam cabinet; (2) exposed to a jet of steam for at least one minute; (3) exposed to a chlorine solution of approved strength (100 parts per million of available chlorine) for at least two minutes; or, (4) immersed in hot water at 170 degrees F. or more for at least two minutes. Utensils should be sterilized between each feeding.

Feeding milk of the same temperature (95° to 100° F.) at regular hours helps to prevent digestive disturbances. It is a mistake to feed sour milk at one feeding and sweet milk at the next. Calves can be raised on either sour or sweet milk if the same kind of milk is fed continuously, but changing from sour to sweet milk causes trouble. Fermented or molded feed will also cause digestive trouble.

Milk from high-testing cows is often too high in fat for calves. The butterfat content of milk may be reduced by adding lime water. After feeding the dam's milk for the first three days, milk from lower testing cows or herd milk may be more satisfactory.

Cattle fed good quality alfalfa hay usually supply plenty of vit-

amin A in the colostrum. However, if the quality of hay is poor, vitamin A may be low by late winter, in which case, cod liver oil or other vitamin A concentrates may be added to the milk to build up the calf's resistance.

The calf pen should be cleaned and disinfected before a new calf is placed in it. If the calf barn is separate from the milking barn, the individual calf pen can be disinfected with cresol. In cases where the odor may be objectionable, a solution of boiling hot lye water can be used. One can of lye to five gallons of boiling water is satisfactory. After the pen is dry, spread a deep layer of straw or shavings for bedding. Never allow the bedding to become wet or soggy. Premises where calves are kept sometimes become contaminated with an infectious organism; this contamination is indicated by the loss of calves placed in these pens. Under such conditions, all exposed surfaces should be thoroughly scrubbed with soap and hot water, followed by the application of a strong disinfectant such as cresol or lye. This application should include the walls, floors, feed boxes, panels, cracks, and crevices of the calf pens.

In addition to being arranged for convenient feeding and cleaning, the pens should be placed so that plenty of sunlight is available. There should be no drafts, and a desirable temperature for a calf pen is between 40 and 50 degrees F. There should be sufficient ventilation for the air to remain fresh. One of the most important factors in the prevention of calf scours is the availability of clean, well-lighted maternity pens. There should be sufficient box stalls or maternity pens so that each can be cleaned, disinfected, and re-bedded between freshenings.

It is a well-known fact that calves placed on partially dry feed at an early age have less digestive disorders and, as a consequence, have less tendency to develop calf scours. A schedule for the care and feeding with the aim of early introduction of dry matter into the diet of the calf is listed below:

1. Clean the cow by brushing and washing if necessary, then place her in a clean and disinfected maternity pen. Wash her teats with a weak disinfectant solution at the birth of the calf.

2. Paint the navel stump with tincture of iodine or iodine-glycerine (1 part of tincture of iodine to 3 parts of glycerine).

3. Leave the calf with the cow for one or two days.

4. Remove the calf to a clean, dry, individual pen and withhold feed for eighteen to twenty-four hours.

5. Begin hand feeding, giving

three to five pounds of whole milk per feed. Milk that is not over four per cent butterfat is preferable. If necessary, reduce the butterfat content of the colostrum by adding lime water. Feed twice a day and at regular times. After the calf has consumed all the liquid milk, give it a little sweet cream buttermilk powder or skim milk powder, by allowing the calf to lick the powder off the fingers. Place some of the dried milk in a small grain box and continue the process until the calf will lick the dried milk from the grain box. Do not increase the amount of liquid milk fed, but increase the powdered milk. (Powdered buttermilk made from sweet cream is apparently more palatable than skim milk powder.)

6. After a few days, usually seven to ten, begin feeding a small amount of a mixture such as the following: 25 lb. rolled or ground barley, 25 lb. rolled or ground oats, 15 lb. wheat bran, 35 lb. dried buttermilk or skim milk, 2 lb. bone meal, 1 lb. iodized salt. The calf will start eating if a little dried buttermilk is placed over the grain. Gradually increase the amount of grain, giving the calf the amount it will clean up between feeds. The presence of grain in the box will help keep the calf from eating its bedding. Clean the feed box before next feeding.

7. At the end of two or three weeks, gradually change the whole milk to skim milk. At the same time increase the grain and begin feeding bright, green, leafy hay. Gradually decrease the liquid skim milk to two to four pounds per feed.

8. At about five to six weeks, depending upon the condition of the calf, liquid milk can be discontinued and the grain and hay ration increased.

The above is a suggested schedule where the milk is sold as whole milk. If the dairyman has plenty of skim milk available, the liquid skim milk may be fed along with the dry feed. Where liquid skim milk is available, follow the first seven steps in the above schedule; then gradually increase the liquid skim milk fed until approximately eighteen pounds is being fed per day. Feed this amount of milk from the third to the sixth month, at which time the skim milk can be discontinued. Give the calves all of the grain and alfalfa they will eat.

Treatment

Since the first symptoms of all types of calf scours are similar, it is difficult to differentiate in young calves between the type of scours caused by improper feeding and the type caused by an infectious germ. In either case, early treatment is essential. Treatment postponed twelve to

twenty-four hours may be too late.

Most cases of calf scours start from simple digestive disturbances, but if not immediately controlled may develop into a serious condition. Strict observance of the precautions listed above will prevent a large percentage of these cases. Exceptions are when the calf is scouring at birth, and in other cases of infectious white scours, or bloody scours. Home remedies are not effective in these particular cases, and the veterinarian should be called for specific treatment. Severe cases, including bloody feces, may be either infectious calf scours or coccidiosis. A laboratory examination secured by a veterinarian will aid in differentiating the two diseases.

At the initial indication of calf scours, the first step is to separate the affected calf from other calves and preferably keep it at some distance from them. If other calves are in adjoining pens, the pen containing the sick calf should be boarded up tight for at least three feet on all sides. This assists in preventing the infected droppings from the sick calf from getting outside where other calves may pick up the germs, and also prevents a draft directly on the sick calf.

The second step is to reduce the amount of milk given the calf by approximately one-half. Continued full feed for a calf with the scours tends to aggravate the condition. Gradually resume full feed after the calf recovers.

The third step is to give an antiphlogistic powder containing a Kaolin base. This product has several trade names and can be obtained from any veterinarian. Stir 1 teaspoonful in the milk of each feed until the feces return to normal consistency. This treatment is very effective. Other treatments, including bismuth subnitrate, have given good results in controlling scours caused by digestive disturbances.

The type of calf scours contracted during the prenatal period requires early administration of hyperimmune serum in large doses. Direct blood transfusions from the dam to the calf are also effective in this type of infection. Vaccine is of no value in these cases because the immune bodies are needed immediately and not in several days.

Immune serum and vaccine are helpful in the control of the common type of infection if a fresh, reliable product is used. Another method of treatment is the use of acidophilus milk. The purpose of this treatment is the introduction of bacteria which gradually force the putrefactive germs from the intestinal tract. This treatment has been reported to be effective. One trouble is that acidophilus milk is hard to keep,

making it necessary to get fresh cultures frequently.

It is far better to prevent calf scours than to expect a satisfactory treatment. If the calf's value does not warrant proper treatment, it is advisable to get rid of it at once because it is a source of infection to other calves.

Breeding Must Keep in Step with Feeding

Condensed from New England Poultryman

Morley A. Jull

Head, Poultry Department, University of Maryland

THE three cornerstones upon which success in poultry husbandry is based are breeding, feeding, and management. Breeding is relatively the most important, for without well bred stock good feeding and proper management may be largely in vain.

During recent years much progress has been made in determining the best kind of diets for growth, broiler production, hatching egg production, and market egg production for birds kept in strict confinement in batteries, in semi-confinement and no confinement on the floor. Much has been accomplished in determining the minimum requirements of proteins, minerals, and vitamins for growth and egg production and some progress has been made in determining the optimum requirements of these ingredients. Well balanced diets make it possible for birds to grow rapidly or produce eggs at a high level. Good feeding, however, does not alter the intrinsic qualities of the growing chicken or laying hen. Their potentialities remain the same. The very best of diets will not promote rapid growth unless the stock is bred for rapid growth. Likewise with respect to egg production, unless bred-to-lay stock is used, the most completely balanced diet it is possible to develop will not produce many eggs. Efficiency in the utilization of feed in egg and meat production is largely a matter of the breeding quality of the stock used.

Improved management practices developed during recent years have enabled poultrymen to get more out of their birds. Good housing, reasonable sanitation, and other sound husbandry practices have enabled birds to more fully express their innate potentialities but there the mat-

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ter stops. Keeping a hen in a palace would not induce her to lay more eggs than she is capable of producing according to her genetic constitution.

The influence of good breeding on egg production is clearly indicated by the very great differences in the average egg production per bird between the high and low pens among three varieties in one of the leading egg-laying contests some twenty-five years ago.

	High pen	Low pen
White Leghorns	202	130
Barred Plymouth Rocks	206	122
White Wyandottes ...	226	142

Although these pens were fed the same diets and were housed and managed the same, the difference between the high and low pens in each case is due to breeding.

Since the cost of feed represents about fifty per cent of the total cost of producing eggs, it is obvious that relatively high egg production is necessary if feed is to be used efficiently by layers. The following data for White Leghorns in previous Maryland egg - laying contests show the importance of having well bred stock.

Avg. Egg production per bird	Avg. No. Lbs. feed consumed per bird	Avg. No. Lbs. feed per dz. eggs laid
127	63.0	6.0
156	75.4	5.8
185	78.6	5.1
214	81.8	4.6
243	85.4	4.2

The data on feed consumption did not include green feed. The data show that it required 1.8 fewer pounds of feed per dozen eggs laid in the case of birds laying 243 eggs as compared with birds laying 127 eggs.

The four factors of greatest importance in determining the number of eggs laid per year are: earliness of sexual maturity, high rate of laying, non-broodiness in the case of general-purpose breeds, and persistence of production. Of these four factors apparently persistence of production is relatively the most important.

Preserving Meat and Poultry by Quick Freezing at Home

Condensed from Farm Research

THE use of freezing and locker facilities throughout the country has become an extremely popular method among farm families for preserving and holding fresh home-grown products over long periods of time. Meats and poultry comprise from sixty to seventy-five per cent of the food preserved in most lockers and home freezing cabinets. Undoubtedly the reason for such popularity is the convenience and ease of preparation of these foods for freezing, the quality and freshness of flavor, and the saving experienced when freezing quantities of home-produced foods.

The freezing of meat is not entirely new; just some of the methods of handling and controlling of storage temperatures are new. Farm people have utilized winter weather a great deal to preserve food in the past. Almost every farmer butchered in the early winter and allowed many cuts of meat to freeze by hanging them in some outdoor spot exposed to the winter temperatures. The chief drawback with this method was that the meat usually dried out badly and also acquired a somewhat undesirable flavor as a result of the wide variations in temperature from day to day. Meat that was not handled in this way was heavily salted or cured and later smoked. Much was also canned. The canned products were palatable, but frequent servings of canned meat quickly lost favor with the family because of the monotonous flavor and because of the fact there were no roasts, steaks, or chops to be taken from the jars. With the advent of mechanical refrigeration, meats and poultry can be kept for long periods of storage under uniformly regulated temperatures and under controlled conditions.

When properly prepared, packaged, frozen, and stored, meats and poultry have a flavor, texture, appearance, and quality comparable to that of the fresh product. In fact, unless one has had considerable experience with frozen products of this kind, it is difficult to tell the difference when cooked between fresh and properly frozen poultry and meats. It is for these reasons that the freezing of these products meets with such favor with farm homemakers.

The freezing of meats tends to

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make them more tender. This does not mean, however, that a poor, tough product will become a choice tender one merely by freezing it. Freezing is only a method of preservation; therefore, one cannot expect to take from his locker any better products than those placed there. Needless to say young animals or birds furnish the best frozen product.

Another factor which should be given serious consideration in freezing meat and poultry is that of the packaging and wrapping material used in packaging these products. Any product that is kept in freezing storage is subject to conditions that cause a product to dry out rapidly unless protected by some material that will not permit water vapor to pass through it. A poorly wrapped or unprotected product in addition loses considerable of its fine fresh flavor and often absorbs foreign flavors which are undesirable.

Cheap wrapping papers or newspapers should never be used. Waxed papers, waxed parchments, and oiled papers are better than nothing, but they too are not satisfactory because they are not moisture-vapor-proof nor even water and blood proof. Many plants where waxed papers have been used have had complaints that were attributed to slow freezing or some storage condition which actually was the result of the use of poor papers. Special coated moisture-vapor-proof papers, special composition sheets, and moisture-vapor-proof cellophanes are most satisfactory for both meat and poultry.

Storage conditions also play an important role in maintaining high quality and freshness in meats and poultry. These products ought to be stored at temperatures of 0°F. Unless they are stored at this low temperature, incipient rancidity of the fat and other undesirable changes of the flesh soon develop.

In freezing meats and poultry there are several misconceptions among locker operators. The most important of these is the feeling that fruits and vegetables must be frozen quickly but that meats and poultry can be frozen in any manner as long as they are eventually frozen. Actually, these products should be given as much consideration as fruits and vegetables. Slowly frozen meats tend to leak or drain more than fast frozen meats and display greater denaturization of the proteins. Freezing can be accelerated by the use of fans which blow the cold air over and around the packages. Proper arrangement of packages so that there is free movement of air around them also helps. The packages should not be large, that is they should not exceed five to seven

pounds. Wherever possible, when using home cabinets for freezing, the freezing compartment should never be packed full because it is imperative that there be free passage of air around the packages and that the compressing unit not be overloaded or else the products may not be frozen for days.

In these times of national emergency, it may help improve or at least alleviate the situation to some extent if those people who have freezing facilities available make more use of them in preserving more of their own foods. It would improve their nutrition and ease the strain made on our many vital industries.

12 Ways To Save Labor on the Poultry Farm

Condensed from Everybodys Poultry Magazine

F. H. Leuschner

FARM management studies show that labor costs on the poultry farm represent from thirteen to twenty-nine per cent of total costs. Chore work accounts for three-fourths of the labor load. These reports also indicate that labor efficiency increases as the "man hours" per hen decrease. Cash returns are materially affected as egg yield per hour of man labor and number of birds cared for per man increase while costs per hen and costs per dozen eggs produced decrease. Efficiency then brings its own reward.

This is true at all times on all poultry farms. In times like the present, when experienced help cannot be had and when even reliable inexperienced help is difficult to secure, the poultryman must find and use such systems of management and labor saving devices as will give him some relief from his labor load.

Year Around Brooding Helps

For some poultrymen year 'round brooding will be part of the answer since it distributes the labor load and makes more efficient use of buildings and equipment. For others, early brooding, for at least part of the flock, gets much of the heavy spring load out of the way before other farm work begins and likewise helps use laying houses more efficiently. All of this means a higher net earning power, especially under the favorable price relationship which exists at present.

Distances between buildings

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are a part of the chore route which on some farms may never be reduced, nor may it be desirable because of such hazards as fire and disease. Changes within the poultry house might be more practical because of the smaller cost involved. Labor saving devices or systems, however, must perform a service for the hen as well as the poultryman if they are to be effective.

Many poultrymen have found that the following practices and equipment save time and labor:

1. *"Built-up" Litter*

This system works best when started in warm weather so sufficient time is available to provide a base of finely broken litter and dry droppings by the time severe cold weather appears.

Instead of cleaning out this dry litter, merely add a thin layer of clean, dry litter as frequently as your observation shows it to be well broken by the fowls and so long as all the litter remains dry, leaving it in the house.

Feeding some grain in the litter, stirring occasionally, redistribution if the birds tend to scratch it to the back of the house, removing wet spots and filling them with old litter before adding new, keeping the proportion of litter equal to or greater than the droppings content so it looks cleaner and stays drier, will make the litter more serviceable as an insulating medium and increase its moisture holding capacity. With late pullets, use several inches of dry sawdust, shavings, finely chopped straw, or commercial litters before adding coarser materials.

2. *Slot System of Ventilation*

Good ventilation, so important to fowl health and comfort, is easily obtained with slots that are placed at the high point in the front side of the pen and act as both inlets and outlets. Easily operated, they are quickly adjusted as the attendant works through the pen doing routine jobs. Windows that slide up and down inside or outside the building are usually counter weighted and stay put with a movement of the hand. A lot of time can be lost and nerves frayed with windows that are hard to move and ventilation systems that don't work.

In insulated houses, the "restricted flow" system of ventilation is used. In others, use of windows plus the slot gives best results. This is more like the "open front" method which requires a greater flow of air to help remove moisture from the house.

3. *Droppings Pits*

Pits cost less than other such equipment to construct, need be cleaned less frequently, do not produce disagreeable odors when house ventilation is correct and droppings are kept dry. With low

pits, hens spend much time on them during the day, thus overcoming the objection that pits take up so much floor space.

4. *Litter Chutes for Cleaning*

Litter goes into poultry houses in bales, in bags, or in bulk. Straw chopped in a fodder shredder or hammer mill can be placed in bags and more easily carried to distant pens or upper floors than in bulk. When pens are cleaned, though only once or twice a year, or pits and droppings boards are cleaned at more frequent intervals, chutes inside or outside the building, trapdoors in the floors of pens, or large windows in the front of the pen are helpful for removing litter and droppings with speed. Litter carriers are helpful in long houses. Often, with a single handling, the litter goes into vehicles that carry it away.

5. *Catching Spilled Water*

Water stands that prevent spillage on the litter may be made of wire-covered frames that support the water container or are placed under it and permit the spillage to fall into receptacles which may attach to a drain or may contain absorbent materials such as coal ashes. An old galvanized tub or part of a barrel cut down may do quite well.

6. *Running Water*

One hundred fowls in production will consume five gallons of water daily. That means forty pounds of water to carry—often up stairs. In a year's time, that figures to about seven tons—a lot of carrying, as many poultrymen know. And in winter it means fighting ice.

Running water does not freeze, and constant flow fountains or bubbling waterers are a big help the year 'round. Where automatic waterers cannot be used, larger receptacles reduce the number of times the containers need be filled. Various types of heating devices are available to help solve the freezing problem. Insulated houses help reduce this problem also, and often eliminate it altogether.

7. *Time Clocks*

Such devices are easily arranged by poultrymen using ordinary alarm clocks. Various commercial devices are available. For evening lights, automatic dimming devices can be attached. Underwriter's requirements and load capacity of electric lines should be checked when any equipment requiring electric power is installed.

8. *Convenient Feed Storage Bins*

Feed bins located in end pens can be serviced from a truck or wagon, as bags are dumped in openings in the outer wall. Feed and litter can be carried to a feed room in the gable by using power carriers, hoists, or elevators. Track carriers are almost a

"must" in long houses. Grade level unloading and platforms for second floor feed rooms all help save hours of strain. Chutes from a feed room or bin in the top part of the building and conveniently placed pen level bins save time and labor.

9. *Well Arranged Egg Cellars*

This includes racks for holding full and empty cases, a conveniently arranged, well lighted packing table, and other equipment such as graders, so located that a routine in handling eggs can easily be set up with a minimum of walking and handling of eggs.

A nice set-up provides room for cases for each of the several grades, flats, fillers, case lids, nails, scales, candler, buffers, stickers, boxes for cracked eggs or those unfit for packaging. Save time and labor within the egg room, not with the practices which must be followed if eggs of high quality are to be marketed.

10. *Gadgets*

Doors equipped with catches that can be opened by elbows or knees when the hands are full are a big help. Non-rusting hinges can be made of scrap iron and bolts or rod iron for doors and hinged roosts.

11. *Catching Fences*

A catching fence consisting of two wire-covered frames, hinged to form a "V" or a right angle, may be used to drive birds into a corner of the room and trap them there for handling. When such a fence is used for culling, those birds to be removed can readily be found and caught without too much disturbance to the others. Two men can remove the culls from 1,000 fowls in several pens within an hour, during routine culling.

12. *Crates for Culling*

Enough crates, whether homemade or commercial, save time and labor in culling and selecting fowls for market or while housing new pullets. They are a real help in grading pullets, another practice which can save dollars in many ways later on in the laying house. Since it insures better returns because the management of each graded group is better adapted to that group, it reduces the extent and labor of the periodic culling job.

In addition, one might list the well known catching hook for each pen and its regular use as chores are done. The "broody coop" can also be a temporary holding pen for fowls which the "hook" removed from the floor because they were no longer valuable as producers, whatever their final disposition. Non-wasting feeders and nests with extended perches so broodies can be kept out at night and so "pickers" can't reach the layers are indirect helps to labor saving.

Pine Oats

Condensed from New England Homestead

H. Ramo

"PINE OATS," a new cellulose cattle fodder, was placed on the open market in Finland last month. Produced from ordinary pine, the new fodder, in nutriment value, is almost on a par with oats, whence it derives its name. The method of producing "pine oats" was developed last fall by Finnish scientists after the poor harvest of 1940, combined with the present import difficulties, created serious shortage of cattle fodder. Current production of "pine oats" is 500 tons daily, and Finland's vast forests assure unlimited supplies for its future manufacture.

Experimental feeding of 100-odd head of cattle and sixteen horses for three months showed this new cellulose fodder to be excellent. Pine oats alone, however, cannot be recommended for a long-time diet. The cows, though apparently thriving on the substitute fodder, did not give much milk. The plan is to mix the substitute with the natural fodder, thus helping to conserve the present slim stocks of hay and oats. Best results have been obtained by feeding the cattle about 6½ pounds of moistened pine oats, 6½ pounds hay and about one-third pound mineral salts daily. The Finnish scientists state, however, that in times of famine, pine oats would maintain the cattle in a fairly good state of nourishment.

The process of manufacture is very similar to that of making wood pulp, except that the boiling process for fodder is much longer. The timber, washed and barked, is first cut up into flakes by machines fitted with rotating knives. Then, mixed with a soda solution, it is run off into huge cookers. The time for cooking the mass, the temperature at which it is kept, as well as the steam pressure used, are trade secrets. The longer it is boiled, however, the more digestible is the fodder.

From the cookers the cellulose mass is run off into enormous containers where it is watered down until it has the consistency of very thin gruel. Repeated washings rid the mass of all impurities of the boiling solution as well as such foreign bodies as sand, twigs, etc. Then the gruel-like mass is ready for the drying

process. It is first spread out mechanically over a very fine-meshed metal screen, through which the water is pressed out. On conveyor belts it is then carried through huge drying machines, after which it is cut up into sheets and piled up in layers, ready for the final process of chopping it up into small particles similar to oats. In this form the pine oats are then packed ready for use in the stables.

Pine oats is only one of several substitutes that Finnish scientists have developed out of forest products to replace essentials now almost unobtainable. Among these, most significant is a process, also developed last autumn, for making sugar out of sawdust and wood waste. Already beyond the experimental stage, "wood sugar" will soon be manufactured on a large scale in two factories being erected for that purpose. Although only two-thirds as sweet as ordinary sugar, "wood sugar" has proved to be twice as effective in preserving, and it is expected to have a ready market for jam making on a commercial scale as well as in the homes.

It's the Calcium . . . Not the Alkalinity (For Successful Inoculation)

Condensed from Soybean Digest

Dr. W. A. Albrecht
University of Missouri

NORMAL development of plants, like any other growth performance, is distinctly a matter of proper nutrition. Nodule production on the roots of the soybean plant, and its use of nitrogen from the atmosphere to let this crop serve as a protein-producing, and a nitrogen-fixing factory on the farm, are determined in the main by the nutritional levels or the fertility conditions of the soil.

Of the 14 chemical elements required to construct plants, 11 must be supplied by the soil in case of the non-legumes. One less, or ten are demanded from the soil by the legumes. The legumes, in the same manner as the non-legumes, use carbon, hydrogen and oxygen provided by air and water. In addition, and quite different from the non-legumes, they can take a fourth nutrient—nitrogen—from the air provided they are operating in co-operation with the proper bacteria on their roots commonly supplied as inoculation.

Much of the attention to the behaviors of legume plants and their accompanying bacteria has centered about the fact that legumes can draw, on the weather, as it were, for four of their nutrient requirements, while non-legumes are limited to three. Little attention has gone to the fact that legumes must still obtain 10 (possibly more) nutrient elements from the soil. *Demand made on the soil by the legumes for these elements is greater than by the non-legumes because the mineral contents of legume forages are of higher concentrations.* These demands are more significant because on these increased mineral contents drawn from the soil fertility store there depends the effectiveness with which the root nodule producing bacteria will work.

Because the soybean can go, via bacteria, to the atmosphere for its nitrogen supply, we must not fix attention so completely on this escape from one responsibility as to forget the ten others

that still lie in the soil. Studies to date have not given sufficient importance to all the soil-borne plant nutrients as these influence inoculation, nodule production and nitrogen fixation by legumes. Critical attention has gone to some, namely: calcium, phosphorus, magnesium and potassium, the four most prominent in the soil fertility list. Consider the importance of these in connection with the soybean.

Since long ago the art of agriculture has been pointing to the need for lime by many soils if they are to grow legumes. Nodulation of soybeans is generally improved by the practice of liming. It is only recently that science has begun to understand the function of liming for better co-operation between the plants and the bacteria. The scientists' first suggestion as to the role of liming soils in giving better legume growth was that lime was effective because it removed soil acidity.

This explanation is about to lose its adherents, in the face of the accumulating evidence that liming serves because it supplies the plants with calcium, one of the foremost soil requirements for both legumes and non-legumes.

Legume bacteria, too, have been considered sensitive to soil acidity. Failure of inoculaton has often been ascribed to injury to the bacteria by the soil sourness. Successful inoculation, or ample nodule production, however, involves more than the idiosyncracies of the plant and bacteria. It involves, most decidedly, the soil as it nourishes both of these properly and sufficiently to make their joint activities result not only in a crop of larger tonnage but one of increased concentrations of proteins and minerals.

Since the soybean must be provided with its specific nodule bacteria when seeded on a soil for the first time, naturally the practice of inoculation of the seed is a recommended one. Failure of inoculation to produce nodules in many instances has brought blame on the bacterial culture, which, like water over the wheel, was past recovery or beyond defense when once distributed throughout the soil. It seemed a logical hypothesis that defective plant nutrition because of soil fertility deficiency might be prohibiting effective inoculation.

In order to test the nutritional value of liming for the soybean plants as compared to the role of lime in neutralizing soil acidity as these two effects encouraged better nodulation, calcium as a chloride was drilled with soybeans in comparison with similar drilling of calcium hydroxide. *Though the latter neutralized soil acidity while the former did not, both treatments brought*

about effective nodulation, deeper green color, and larger plants of more stable cell structure. The nodules were not necessarily located in the soil areas into which the calcium compound was deposited. Roots in the acid soil areas bore nodules. Here was evidence that liming was improving the results from inoculation because lime was providing calcium.

In order to separate the nutritional values of calcium for the plant from those for the bacteria, more detailed tests of the soybean and its calcium needs were undertaken. It was readily demonstrated that calcium was more important than magnesium or potassium in the early life of the soybean plant.

A deficiency supply of calcium encouraged attacks on the plants by a fungus resembling "damping off," and brought failure of inoculation.

To determine the minimum amounts of calcium required per plant for effective establishment of the stand, calcium was used in the solution form and in the form absorbed on colloidal clay. The latter method permitted variable amounts of clays at different degrees of acidity (pH). It thus permitted controlled amounts of calcium at any pH or degree of acidity desired. *These trials demonstrated that the soybean's early growth was dependent on a significant supply of calcium more than on a particular degree of soil acidity.* Nodulation could not result later unless liberal levels of calcium were provided early to carry the plant to the inoculable age. More detailed separation of the calcium as a nutritional element from its role in modifying the soil's reaction as this influences nodulation was undertaken by using acid clay neutralized to different pH values or degrees of acidity through titration with calcium hydroxide.

Constant amounts of calcium were provided at different pH values by taking the proper amount of clay at a particular pH. Thus by placing these different amounts of the clays of different pH values into sand for soybean growth, there were provided soils of variable pH but of constant supplies of exchangeable calcium. Plant growth and nodule production showed clearly that even though the soybeans reflected their response to differences in soil acidity, they reflected far more their growth and nodulation response to the amount of calcium provided.

Nitrogen fixation, or an increase of nitrogen in the crop over that in the planted seed, did not occur even in a neutral soil unless the supply of calcium was ample. It occurred in acid soils containing liberal supplies of exchangeable calcium. *Here, then,*

was distinct evidence that if inoculation of soybeans is to be effective in making this crop serve for soil improvement, the soil must deliver calcium to these plants.

We may well imagine competition between the soil and the plant for the lime. The absorbing power of the soil for nutrients like calcium, potassium, magnesium and other substances is appreciable. It was demonstrated by means of better soybean growth, nodulation and nitrogen fixation, that placing the calcium on a small amount of soil to saturate it highly is more effective than is placing it on much soil to increase the soil saturation only slightly.

These effects from variable degrees of saturation of the clay by the plant nutrient demonstrated similar results regardless of whether the variable calcium was accompanied by acidity or by neutrality. The soybean growth proved that it was not the acidity that disturbed plant growth, but that it was the deficient soil fertility commonly present when soils become acid. Likewise it demonstrated the more efficient use by the plant of the applied calcium in a soil more highly saturated by it. It also suggests a higher efficiency for drilling soil treatments than for broadcasting them.

That calcium is needed for the legume bacteria as they live independently of their host has become a well known recognized fact. With limited lime supply they become abnormal, and fail to inoculate. But given plenty of calcium, they grow well and are effective inoculators.

Unless both the plant and the bacteria have access to calcium, effective inoculation can not be expected. Lime for a legume—even an "acid tolerant" plant like the soybean—plays a helpful role because it nourishes the plant rather than because it removes soil acidity. Even an acid soil must supply lime for successful inoculation and growth of the soybeans.

Phosphorus, like calcium, is a requisite if soybeans are to be active in nodule production and in nitrogen fixation. But its importance and behavior are closely related to the amount of calcium. Unless calcium is amply supplied, soybeans are poorly nodulated, and are poor nitrogen fixers for soil improvement. In fact they may even lose phosphorus back to the soil, so that the final crop will return less phosphorus when harvested than was in the planted seed.

That magnesium should be helpful toward better soybean inoculation has not come to our attention because relatively little magnesium is required by the plant, and most soils are not seri-

ously deficient in this nutrient. This element is effective on soybeans, but probably indirectly as well as directly. It makes calcium more effective, and thus illustrates the fact that fertility elements work together. These effects suggest an interstimulation among the elements, so that the final results can not be considered, merely as additions of the values of their effects when applied singly.

Improved inoculation may also be dependent on the potassium supply in the soil. Experimental studies demonstrated increased nodule production and better growth as potassium deficiencies of the soil were remedied. With more liberal amounts of potassium, however, particularly in contrast to the amount of calcium, inoculation may be less effective and give reduced nodulation and nitrogen fixation. Excessive potassium in relation to calcium makes the soybeans produce more tonnage, but they fix less nitrogen and become more clearly non-legumes than legumes. They move into the class of woody vegetation, and out of the class of vegetation with high protein content of high nutritional value as animal forages.

Inoculation, or the introduction of nodule bacteria with the seeding of the soybean, is not necessarily a practice that will compel the plant to accept the companionship of the bacteria. The latter cannot use cave men tactics. Rather, the plant and bacteria will unite in their efforts toward getting their necessary nitrogen out of the gaseous supply in the atmosphere only when the soil provides liberally of all the nutrient elements required by both the plant and the bacteria.

Successful soybean growth on soils of declining fertility can not be guaranteed simply by the introduction of a few particular pedigreed microbes. The plant must first be healthy because it is well fed with calcium, phosphorous, magnesium and other soil-contributed elements. Unless it is well nourished by the soil, the inoculating bacteria will not asociate with it to give it the one distinguishing character so desirable in legumes, namely, nitrogen fixing capacity.

Inoculation, or the introduction of the bacteria, is no substitute for the high levels of soil fertility that are demanded for successful legume crops.

A Box Type Lamb Brooder

Condensed from Electricity on the Farm

R. L. Saling

Farm Service Supervisor, Eastern Oregon Light & Power Co., Baker, Oregon

SHEEP raising is one of the larger industries in Eastern Oregon because this part of the State is ideal grazing land. The lambing season usually extends from the latter part of January to the first of April, during which time there is often extremely cold weather accompanied by high winds and snow. Ewes are not confined to barns but are left out in the open during the lambing season and thus there is great chance for loss of lambs by exposure. Through the able help and advice of Mr. D. E. Richards, Superintendent of the Eastern Oregon Experiment Station at Union, Oregon, the rural department of the Eastern Oregon Light and Power Company undertook to develop a lamb brooder.

A newly born lamb, particularly when chilled, is one of the most helpless of domestic animals. We were reasonably sure that we would need a brooder of the type which would confine the lamb. In the construction of this brooder we were able to profit by the results of older inefficient methods of reviving chilled lambs. Heretofore the lamb was placed in an apple box in which gunny sacks had been placed and left close to a wood stove. It is unsatisfactory because the heat is not applied evenly. The method also requires a great deal of attention from the attendant in handling the lamb and also in watching the fire.

Another inefficient method which has been in use for many years is submerging the animal in heated water. There is then the problem of drying the lamb and keeping it from becoming chilled when exposed to cold winds after it has been returned to the ewe. This also requires much time and attention from the attendant and is uncertain in its results.

The brooder we built is forty-eight inches in length, twenty-eight and one-half inches in height, and twenty-eight inches in depth — all outside measurements. It is made of three-quarter inch Insulite which is waterproofed, is an excellent insulator and is very strong. In putting the

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brooder together, we used cement-coated nails without any interior framing. An SW3 Lyon circuit breaker and a No. 2 Wafer for thermostatic control was used to regulate a Type C screw-base heating element of 300 watts. This element has capacity enough so that an inside temperature of 120 degrees can be maintained with a variation of only one degree from the off and on position of the circuit breaker. A type R1 chick brooder ventilating fan was built into one end of the brooder to insure a constant supply of fresh air. The fan draws in a constant supply of fresh air and forces it around the heating element where it is warmed before reaching the lamb. Three ventilating ports with adjustable covers were placed near the top of the brooder to control the discharge of air. A removable tray covers the entire bottom for convenience in cleaning and for sanitary reasons.

A partition is placed the full width and depth of the brooder ten and one-half inches from the fan end to keep the revived lambs away from the heater and fan. A hole ten inches by twelve inches was cut in the partition and screened. Several additional ventilating holes one and one-half inch in diameter were made near the top of the partition to allow maximum circulation of air.

We have experimented with both sixty watt Mazda CX lamps which produce some ultra-violet and sixty watt inside frosted Mazda lamps for light and heat from above. Because of the short length of time that a lamb is in the brooder, we found no advantages in using the more expensive CX lamps. A double-pane glass window with panes set one-half inch apart was placed in the door of the brooder so that the interior could be inspected at any time without opening the door.

In operation, this box-type brooder is quite successful, especially on prematurely born lambs. The length of time required to revive a chilled lamb is between thirty and forty-five minutes, depending upon the condition of the animal when placed in the brooder. An inside temperature of ninety degrees was maintained at all times. The brooder will use approximately fifty kilowatt hours of electricity per week when in continuous operation and has a capacity of from six to eight lambs at one time.

This is the third year the experiment has been conducted with this type of brooder. The Eastern Oregon Experiment Station has a band of 1,100 ewes, approximately ninety per cent of which are yearlings and the brooder is in constant use each brooding season. Mr. Richards is

very enthusiastic because of the increased number of chilled lambs which have been saved since the brooder was placed in use. During the 1941 lambing season, no lambs were lost at the Eastern Oregon Experiment Station due to chilling.

A Reliable Sow Pregnancy Test

Condensed from American Hampshire Herdsman

Ralph Bogart and D. T. Mayer

Department of Animal Husbandry, University of Missouri and the Bureau of Animal Industry, U.S.D.A.

THERE is a need for a method of detecting pregnancy in all farm animals because considerable time and money are lost to breeders who now must keep some non-pregnant animals until external signs indicate that they failed to settle. A simple chemical pregnancy test for swine, developed by the Missouri Agricultural Experiment Station and the Bureau of Animal Industry, U.S.D.A., meets this need for swine breeders.

This pregnancy test in addition to meeting the needs of swine breeders also possesses the characteristics which are necessary for any pregnancy test to have practical value.

1. The test is accurate.
2. It makes the detecting of pregnancy in early gestation possible.
3. It is simple and results are quickly obtained.

The sow differs from other farm animals in that her urine contains large quantities of estrogens from the 22nd to the 32nd days of pregnancy and from the 72nd day to term. During the period from the 32nd to the 72nd days of pregnancy there is no more estrogen in the urine than is present in urine from non-pregnant sows. This pregnancy test in swine is based on the increased urinary estrogen concentration during the early part of pregnancy, beginning the 22nd day.

In the urine of the sow, pigments are present which interfere with the accurate reading of the test. Methods have been developed for removing these interfering pigments, and these methods are described in detail below.

The chemical procedure consists of an extraction to remove estrogens from the urine and the

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addition of sulfuric acid to the estrogen-containing solvent. In the presence of sufficient estrogens the sulfuric acid produces a greenish fluorescence.

Since estrogens are not usually present in sow urine in sufficient quantities to give the greenish color except at the two peak periods during pregnancy, positive tests are seldom, if ever, obtained in the open female or at other times in the pregnant animal.

Although the test is simple and no special chemicals are needed, great care must be taken in all steps, particularly in reading the test.

Tests must be run between the twenty-second and the thirty-second days of pregnancy; or following the seventy-second day of pregnancy; therefore, breeding dates are always essential.

It is not to be expected that most breeders will have the necessary training and equipment for making a chemical pregnancy test. Since the estrogens in urine are quite stable, urine samples can be collected by the breeder and sent to some laboratory where proper equipment and trained technicians are available.

First step in making the pregnancy test is for the breeder to collect a urine sample from each bred sow or gilt — between the 22nd and 32nd days of pregnancy or after the 72nd day. Urine may be collected in a container that has been cleaned with soap and water. No special cleanliness or sterile precautions are necessary.

Urine is more easily obtained from the sow early in the day. We suggest that at least one ounce of urine should be collected, although half that amount would suffice. Urine which has been kept for a month or more has been as satisfactory at this station as sterile urine.

Our results show clearly that this modified Cuboni test described in detail below is a means of positively detecting pregnancy early in the gestation period and of clearly differentiating between pregnant and non-pregnant sows.

The authors recommend the technique described here in detail and with each step in its proper sequence for the diagnosis of pregnancy in the sow:

(1) To ten cubic centimeters of filtered sow urine add 1.25 cubic centimeters of 10% aqueous zinc sulphate and 1.25 cubic centimeters of N/2 sodium hydroxide. Mix thoroughly.

(2) Centrifuge or filter to remove precipitated material.

(3) Add two cubic centimeters of concentrated hydrochloric acid to the filtrate or supernatant fluid and hydrolize for ten minutes.

(4) Cool to approximately fifteen degrees centigrade and filter.

(5) Add twelve cubic centimeters of benzene (or other solvent) to the filtrate in a separa-

tory funnel and shake for three to five minutes.

(6) Allow the mixture to stand until the urine and the solvent have completely separated. (If separation is extremely slow, the addition of a small amount of sodium carbonate is an aid.)

(7) Drain five cubic centimeters of the solvent extract into a clean dry test tube. Add one cubic centimeter of concentrated hydrogen sulfate.

(8) Heat to sixty to seventy degrees centigrade with frequent shaking, for five minutes, preferably until the solvent is nearly colorless.

(9) Cool thoroughly and allow to stand for at least thirty minutes before reading the test.

(10) Use reflected sunlight, or blue artificial light in a dimmed room, for illumination in reading the test.

(11) A green fluorescence of the acid mixture indicates a positive test. A negative result is indicated by a brown or reddish brown color.

(12) Check results by adding one cubic centimeter of water to the mixture after it has stood for twelve hours. Shake thoroughly and cool. All indications of green will be absent from the non-pregnant samples after the water is added.

(13) The test must be run on samples taken from the 22nd to the 32nd day of gestation, or after the 72nd day; therefore, breeding records are essential.

The Animal Breeding Laboratory of the Department of Animal Husbandry, University of Missouri, has helped breeders by diagnosing pregnancy in horses in the past. The same services are now available to hog breeders. Workers in the laboratory will help anyone to learn the technique of making the test. Tests also can be made in the laboratory but a small charge, similar to what is asked of the horse breeders, may be necessary to cover costs of chemicals and additional labor.

* *This test was developed through co-operative studies by the Department of Animal Husbandry, University of Missouri and the Bureau of Animal Industry, U.S.D.A.*

Musician's Reeds Grow in Valley

Condensed from Texas Farming and Citriculture

NUMEROUS products imported into this country before the outbreak of war in Europe are now being sought here in the United States. The searchers for some of these products have directed their attention to our semi-tropical regions and particularly to the Lower Rio Grande Valley, where the happy combination of a warm winter climate, exceptionally rich soil and plenty of moisture in rainfall and in irrigation canals, is conducive to the growth of plants that do not flourish in colder and more arid areas.

A plant hunter who has been successful in the Valley is Georges Apchain, who was born in France, came to America some thirty years ago and played a wind instrument in the New York Philharmonic Orchestra for twenty-five years. One of the requirements of players of such instruments are small pieces of wood of a very special kind. They are fitted into the mouth and are called "reeds." At the beginning of the European war the only source of the wood from which the reeds were made was the country in Southern France near Monte Carlo. The wood soon ceased to be obtainable there, the tall plants from which it was taken being ruthlessly cut down for camouflage material and other uses remote from the production of music.

Georges Apchain was an importer in New York as well as a musician, and finding that he could import no more reeds, it occurred to him that the reeds could easily be made in the United States — if the required variety of wood could be found. This is from a plant called giant reed or scientifically, Arundo Donax. He made inquiries as to its presence in Florida and learned that this particular plant was not grown there and probably couldn't be commercially because of a lack of the right kind of soil. A report from Southern California was similar. Ordinary reed plants are common enough on the Pacific Coast, of course, but the information obtained indicated that none quite fulfilled the reed wood requirements, which are of exceptional lightness and hardness and a fine grain.

Botanists of the U. S. Department of Agriculture were asked if they knew where Arundo Donax might be grown and they mentioned Dr. Trible, of Brownsville, who had written to the De-

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partment about what appeared to be this very plant, which was growing in profusion on his land near Brownsville. The doctor had informed them that the plants did not produce seeds but had spread from two roots transplanted years ago from Fort Brown, where they might have been set by governmental agronomists who were doing some experimental work here at the beginning of this century.

Plant Hunter Apchain lost no time in getting in touch with Dr. Trible, and for about two months has been in the Valley working with the doctor to grow enough of the giant reeds to keep all the wind instrument musicians in the United States supplied with the little reeds they need as mouth-pieces. He also represents the DeBruille Chemical Corporation of New York in the development of certain plants, heretofore imported, which have properties valuable in the manufacture of apothecaries' supplies. A piece of land in the vicinity of Brownsville has been acquired for experimental growing and a laboratory.

Sweet Gum

Out of Clarke county, Alabama, comes a sweet story (and true) about a family that got off the relief roll, thanks to sweet gum trees. (Tree is variously called sweet gum, red gum, liquidambar.) I. G. Few gathered and sold 1,000 pounds of gum at fifty cents a pound the first year, then got a contract for all he could supply. The gum is used in making munitions, also in manufacture of chewing tobacco.

Gum gathering is about like a cross between turpentining and making cane syrup. Trees are cut and the gum gathered similar to turpentining. Before shipping, the gum is brought to a boil and strained. Shipment is made in 50-pound cans.

Sap oozes from the trees in two weeks following tapping. As each tree delivers its gum, it is cut again for future collections. Each tree normally produces gum for a period of six years. Gum gathering begins around May 1st and lasts until cool weather each fall. A day's gathering may amount to fifteen or twenty pounds. During World War No. 1 prices soared to $8 a pound.

—*Farm Journal*

Poultry Manure Is Worth Money

Condensed from The Poultry Item

Emil G. Glaser

OUT in Iowa there is a farmer who produces more than 40,000 pounds of poultry droppings annually from a commercial farm flock of 1,000 Leghorns. This valuable by-product spreads over the area of several fields each year. The result has been a steady increase in yield each year of five to ten bushels per acre for corn and oats and several tons per acre of soybeans and alfalfa. Expressed in terms of dollars and cents this farmer estimates that it increases his annual income by $600 to $800. This is the value that can be placed on the manure.

That poultry droppings are valuable and should therefore be handled accordingly, has long been known to poultry investigators and by practical farmers who have tried this nitrogen-carrying fertilizer on their fields.

An indication of its great fertilizing value may be had in the analysis of its contents, which although variable, nevertheless shows it to be vastly superior to other forms of manure produced by farm animals.

MOISTURE: The moisture content ranges from 50 to 60%, depending upon the time of year, the amount of water the bird drinks, and the nature of the feed given. The physical makeup of the bird also enters in. Watery droppings, for instance, may indicate a digestive disorder. Colored droppings may indicate a disease.

ORGANIC MATTER: This is also variable, ranging from 25 to 35% of the entire volume dropped.

NITROGEN: This ranges from 1.5% to as high as 2.5%. Older birds produce manure lower in nitrogen content than younger ones. Young birds that receive a high protein ration usually produce manure higher in nitrogen content. This constituent is the most valuable fertilizing part of poultry droppings.

POTASH: Between 0.4 and 0.6% of poultry droppings consist of potash, a valuable fertilizing constituent. This is of course one of the lesser constituents found in poultry manure and may even have to be added to soil on which chickens run, according to the findings of an English investigator. His explanation is that the ratio of available phosphate becomes too great in proportion to the potash

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on such land after poultry has used it three years straight. In the United States poultry runs are usually cropped every other year. Therefore, here it probably does not present a problem of significant importance.

PHOSPHORIC ACID: In some samples of poultry manure studied by investigators the acid content has not exceeded 0.5% while others show as high as 1½%. Because of the fact that the phosphate content of the soil remains within the top two inches, this constituent is increased rapidly when poultry either runs on land or carefully preserved droppings are added. The fact is that the phosphate content can be practically doubled in a year or two. Therefore, for soils deficient in phosphate, poultry manure plays as important a role as it does to supply nitrogen.

CALCIUM: Well stored poultry manure will run around 1% calcium oxide. Many soils in the eastern sections of the country have to be limed in order to keep them from becoming too acid. However, for grass crops, garden truck, and most farm crops, poultry manure is a well balanced fertilizer and its use is encouraged even if additional liming must be resorted to.

Fertilizer per 100 *Hens*

Another way of picturing the value of poultry droppings is to analyze the manure produced during one year by 100 hens. The total production amounts to more than 4,000 pounds, and from it may be had forty pounds of nitrogen, fifteen pounds of potash, and thirty-four pounds of phosphoric acid in a form readily available to the plant.

Poultry raisers have long realized the value of poultry manure. Few have made a real effort to sell it for what it is worth. It is worth while to study some of the ways in which these wide-awake poultry raisers produce, store, and dispose of this fertilizer.

Many poultry raisers buy commercial poultry litter with an eye to the increased value of the manure. When poultry manure and commercial poultry litter have been mixed well by the constant daily addition of the droppings, the near powdery product may be sacked and sold to gardeners and orchardists at a very lucrative price. In fact, in these cases it becomes, as some packers have said about some of their so-called by-products—more valuable than the main product."

Commercial litters have the property of high absorptive power, therefore absorbing the moisture content of poultry manure and rendering the constituents "fixed." It is stated by investigators that poultry manure which has not been stored properly will lose fifty percent of its fertilizing value. Fermentation is

one of the main causes of loss in value of poultry manure.

One large establishment in the east sacks its poultry manure and markets it in the same efficient manner in which it markets eggs, broilers, and other poultry meat.

But even if poultry manure cannot be turned into immediate cash, it still has great potential value when used by the poultry raiser himself. In fact poultry droppings which have been well preserved are the finest fertilizer a poultryman can put on his own land. Crops such as grain and grass are "ready made" poultry feed.

In eastern states where land values prohibit poultry raisers using more land than they can actually get along with, poultry manure can be used to grow richer, more succulent range grass, as has been done in England the past fifty years. Grass, as we know, is a high-vitamin feed.

The job of preserving poultry manure is important. In some cases poultry raisers use gypsum, ground rock or acid phosphate on the dropping boards to dry out the manure and make cleaning easier. When dropping pits are used, the odor may be killed by using phosphate, creosote, or some other coal tar product. This also keeps flies from breeding in it.

If the manure is stored in garbage cans near the poultry houses in order to facilitate speed in cleaning by hand, it is well to sprinkle either rock phosphate or a little kerosene on top of each new addition. This keeps flies from breeding in the manure and the phosphate will help, while the kerosene does not hurt its fertilizer qualities. If flies are allowed to breed, the maggots will injure the fertilizer value.

In large plants the poultry manure is carried out to storage pits or sheds some distance from the poultry houses where it is dried, sacked, and sold to greenhouses, truckers or others. This is an effective way to dry and store poultry manure. Cleanings from the floor of laying houses when mixed with poultry manure from the dropping boards, assures proper drying by absorption of all material.

In areas where the laying cages are used, a great deal of poultry droppings may either be artificially dried or mixed with a commercial poultry litter or rock phosphate.

At the Kimber Poultry Farm in California a large central vacuum plant sucks the poultry litter through hose connections from the houses into large fertilizer bins where it is held until sold. The force of the suction breaks the straw into minute parts and fairly pulverizes the droppings.

The Search for Better Grass

Condensed from Pacific Rural Press

John E. Pickett

THE man who was digging up bunches of grass on a hillside in San Luis Obispo county, proved to be Dr. R. Merton Love, in search of superior strains of bunch grass. He was engaged in the important endeavor of improving California's largest and most valuable crop—grass.

Doctor Love is a new member of the Agronomy Division of the University of California, and was brought here from McGill University in Canada, to work on the problem of improved range grass varieties under an endowment made by the late Mary J. L. McDonald.

He was digging up clumps of Needle grass which he had previously marked as superior and had had under observation during the growing season. These will be taken to University plots for further observation and experimentation.

His search is for natural hybrids, superior in growth, and apparently immune to smut and rust. By modern methods, attempts will be made to change the chromosomes of some of these in the test plots, and produce further variations, and further improvements.

The special target of interest at this time is the Needle grass, because it is one of the best of the natural pasture grasses, but other varieties of natural grass are also under study.

The Needle grass, which he was digging up still showed some green growth, after the other grasses had turned dry. It seems to offer an advantage where the pasture is grazed early, and not overgrazed, and then comes along.

In these pastures there is quite a variety. Among them are wild oats, lots of chess, some bur clover, etc. These pastures are not at good as they used to be. Grazing practices have punished them, in many cases, and Nature, always experimenting, produces new hybrids and strains, some of them superior, but perhaps not given much chance by man because of pasturing punishment.

Grass is the most valuable crop in California. Approximately 80 per cent of the state has no other agricultural use, except grazing. That means that man has had a rich inheritance in the natural pastures, but they are not as

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good as they were when he found them.

Dean C. B. Hutchison, of the College of Agriculture, says that very little has been done by any state in studying improving native pastures. Through the generosity of Mrs. McDonald, who left her estate for experimentation, California has had a chance to study and help improve a great natural resource.

There is no doubt, according to Dean Hutchison, that even the simplest form of propagation could greatly improve the grass of this state. He points to the experience of the Institute of Forest Genetics in Placer county, where simply by selecting seed from thrifty forest trees they have demonstrated a tremendous speed-up in growth.

In the start with selection of native grasses he finds already a great stimulation in growth, in some cases the selected strains making a dozen times the growth of the unselected.

But the College is not going to stop with mere selection. In the laboratory they are going to upset the chromosomes by the use of X-ray, modern chemicals, and neutron rays from the cyclotron. This scrambling of inheritance tendencies can and is expected to produce violent and different and often startling and sometimes very valuable results.

Cork

We'll hear more about growing our own cork in the next twenty years. Cork stripped from cork oak trees growing in California has "proved just as good as imported cork of the same grade, if not better," Crown Cork and Seal Company reports. Climate and soil in California are similar to those in many parts of Spain and Portugal, whence cork has been imported. Our imports have averaged over $2,000,000 a year in the past ten years.

—*Farm Journal*

Stallions and Jacks Poisoned by Aloes

Aloes or aloin, commonly used as a purge for horses and mules, should never be used on stallions or jacks. In these animals, fatal diarrhea is almost always sure to follow a dose of the drug which would not be harmful to mares or geldings.

—*Successful Farming*

A Five-Year Program for Corn-Livestock

Condensed from Better Crops With Plant Food

H. B. Franklin

County Agricultural Teacher, Moultrie, Georgia

WHEN a farming community decides that it is necessary to add to its cash income, one of two things usually happens. Farmers either increase the acreage of their best paying cash crop or look for an entirely new crop enterprise. This situation faced the citizens of Colquitt County, Georgia, in 1938. The three primary cash crops, limited in acreage, were bringing in too small an income to meet the needs of the farming population. In three years the farmers have developed a cash crop that is adding at least $500,000 annually to their income.

This was accomplished without following either of the time-honored methods. Instead, two minor cash enterprises in the county were combined in such a manner as to make them pay off in a big way. By applying modern methods of production to the corn acreage and then in turn feeding this corn to good livestock, both hogs and cattle, a new source of income that bids fair to outrival all other crops in the territory and to become the mainstay, not only of this South Georgia County but of the entire Southeast, has been found. Behind this movement and in its accomplishment is a story of rural-urban cooperation and of clear thinking on the part of farm leaders that is well worth emulating.

Early in the winter of 1939 a small group of businessmen of Moultrie, aware of the inter-dependence of urban and rural communities, listened to a plan for increasing livestock production in the county. For several years before that the county had averaged around 75,000 acres of land in corn production. The average yield for the previous 15 years was 11.3 bushels per acre; for Georgia, it was close to ten bushels. Many Coastal Plains counties were fully as low as the State average. These figures are based on U. S. Department of Agriculture reports. Corn acreage producing such low yields as this doubtless led to the old cries, familiar to Southern farmers: "It costs a dollar a bushel to produce corn in Georgia," and "I can buy corn cheaper than I can grow it."

Reprinted by permission from Better Crops With Plant Food, Washington, D. C., Dec., 1941

Repeated so long and so often that many farmers believed them, these sayings unconsciously had their effect in low yields of corn and lack of attempt to improve or change the practices that tend to make costly yields. In other words, the farmers had been growing "dollar" corn.

It was pointed out that there is no law against higher corn production and that whenever and wherever a farmer has put into his corn production the proper care and attention, using fertilizers and ploughing under humus in sufficient quantities, he has been able to produce quite satisfactory yields at a cost low enough to allow the feeding of his corn to livestock and making a profit therefrom.

A plan for a 5-year 10-acre corn production contest was proposed and adopted. Each farmer participating was to enter at least ten acres of corn in the contest. The county was divided into four districts and the corn into two classes, solid corn and interplanted corn. Duplicate prizes were offered in each district and in each class. This made a total of eight prizes of a kind. First prize was a purebred bull calf, second prize a ton of fertilizer, third and fourth prizes purebred pigs. The businessmen, through the local Chamber of Commerce, agreed to furnish the money for the prizes. It was pointed out that by increasing corn yields from 11.3 bushels per acre to an average of forty bushels and in turn feeding this corn to good livestock, the farmers' income could be increased $2,000,000 annually.

This plan was presented to the farmers by the vocational teachers in all their evening and part-time class work. The county agent mailed letters and application blanks, and the local papers gave publicity to the plan and its progress. About 200 farmers entered the contest for the first year with 2,000 acres of corn.

When measuring time came, the agricultural workers measured each 10-acre plot. The first year yields were quite satisfactory, the highest yield in solid corn being 622 bushels on the ten acres. The top yield in interplanted corn was 500 bushels. However, the averages were the interesting factors. On solid corn it was thirty-five bushels per acre and on interplanted twenty-nine. When fair allowance was made for the additional feed value of the interplanted crops and this was interpreted in terms of corn, the average yield was thirty-nine bushels.

The second year of the contest saw many farmers interested in the problem of feed production. About 3,000 acres were entered, and many thousand additional acres received fertilizer and proper care. Farmers were asking

their vocational teachers for information on corn production. They were talking to their neighbors, comparing methods, soils, and fertilizers, and swapping experiences. They were beginning to awaken to the possibilities of new cash crops.

The second year's results were outstanding—300 farmers on all kinds of farms were proving something to themselves and to the State. The highest yield on solid corn was 862 bushels and on interplanted it was 598 bushels plus an abundance of additional feed. Here again we have interesting averages. On solid corn it was forty-three bushels per acre and on the interplanted it exceeded thirty bushels. On both solid and interplanted corn the average was 37.4 bushels per acre. With the additional feed value of the interplanted crops translated into terms of corn and added, the average was at least forty-five bushels of corn per acre.

In measuring each plot of corn a complete history was taken and the fertilizer cost determined. Since this information had nothing to do with whether or not a man won a prize, there was no reason to doubt its accuracy. When we allowed $10 per acre for land rent, labor, seed, etc., and added to this the fertilizer cost of less than $4 per acre, we found that it cost the farmers an average of 30½ cents per bushel to produce this corn. It was conservatively estimated that because of the corn contest Colquitt County farmers harvested and fed to livestock at least 500,000 bushels of corn that they would not have had were it not for the interest created by the contest.

The second year of the contest was a fairly good year in the county, and someone wanted to know what would happen when we had a bad corn year. This question was very effectively answered in 1941, the third year of the contest. We had a so-called "bad" corn year, but here are the answers. We did not get 862 bushels from our best ten acres. We did get 797 bushels — but again let's look at the averages for they tell the real story. On solid corn we rolled up the impressive average of 44.7 bushels per acre and on the interplanted 35.5 bushels, or 41.7 average on all corn measured in the contest. With feed allowances of fifteen bushels per acre on the interplanted corn, a grand average of forty-eight bushels to the acre was made. The cost for fertilizer was eight cents per bushel, with the total cost under thirty cents per bushel.

We have conducted the Colquitt County 10-acre corn contest for three years. During that time approximately 8,000 acres of corn have been entered. Many times that acreage has been affected by

the practices advocated in the contest. Farmers are planting their entire corn crop on a new basis. They are recognizing the value of good seedbeds, good prolific varieties of seed corn, proper and complete fertilization, and correct cultivation methods. No longer is the corn crop being neglected, no longer is it being treated as a "necessary evil just so's to have corn to feed the mule." It is being cared for just as carefully as the other cash crops on the farm.

Many changed practices are coming into use among the farmers of the county. More winter legumes are being used. Farmers are recognizing the fact that humus, a storage medium for moisture as well as plant food, is absolutely necessary.

Many of the farmers are growing corn interplanted with velvet beans, peanuts, or soybeans. They harvest and store what corn they need for feeding the work stock and for finishing feeder steers or early spring hogs and then turn their hogs and cattle into the fields to harvest the remaining crop. In most instances they have sufficient feed on the field after the corn has been gathered to give several hundred pounds live weight gain to the acre. In addition to the profit from the cattle or hogs thus fed, the farmer is returning to the soil most of the plant food consumed in producing the crop. After the livestock have cleaned the feed from the land all litter left is disked in or turned under, thus adding much needed humus for plant food and water-holding capacity. By adding a reasonable amount of good complete fertilizer to the corn crop and keeping the humus in the soil, many farmers are able to plant the land continuously in this crop and receive better yields year after year.

In 1939 W. O. May, of the Reedy Creek community, planted his corn in 6-foot rows interplanted with velvet beans and peanuts. He used 200 pounds of 2-10-4 fertilizer under the corn then top-dressed with 100 pounds nitrate of soda. His yield was forty-eight bushels to the acre plus sufficient peanuts and velvet beans to give 300 to 400 pounds livestock gain per acre. Using the same methods and same fertilizer in 1940 he was again tops in his district on interplanted corn with fifty-two bushels to the acre plus an unusually fine yield of feed.

Part of the field was used for his tobacco and cotton allotments in 1941 and only about four acres were left for corn. His 10-acre contest corn was transferred to another field, but on the four acres he received better than sixty bushels per acre. Continuous satisfactory corn yields are possible where proper care is

given to fertilizing and humus is added to the soil. This of course would not be practical with solid corn without continuous planting of winter legumes.

Wm. G. Newton and son David last year planted ninety acres of corn, all fertilized and mostly interplanted. They exchanged their cottonseed for cottonseed meal, harvested thirty acres of good oats followed with lespedeza that yielded thirty-four tons. They ground their own corn and hay and fed out fifty-seven head of cattle that were raised on the place. They sold more than $3,000 worth of cattle, added several good heifers to their herd, fed their work stock, and finished several hundred dollars worth of pork for the market.

In 1941 they produced 509 bushels of corn on ten acres plus a good crop of soybeans and velvet beans that added another 150 bushels feed value. For the Newtons this won a purebred bull calf worth $150. This bull added to an already good herd of grade cattle, and backed by a general farm program that assures the herd plenty of good feed at a low cost, is putting the Newton family in the livestock business in a big way. Mr. Newton told the writer that seven years ago it was difficult to obtain a yield of ten bushels of corn per acre from the land that this year produced in terms of feed an equal of sixty-five bushels of corn per acre. This increased yield was obtained by a program of interplanted feed crops with corn, harvested mostly by cattle and hogs, and all the litter turned under with an occasional winter legume crop and a reasonable amount of fertilizer. This year they followed a good cover crop of Austrian winter peas with corn fertilized with 175 pounds of 2-10-4 per acre. The actual fertilizer cost was $1.97 per acre.

Below are some of the actual fertilizer practices and yields secured in the 1941 contest:

John W. Good:
400 lbs. 4-8-6 under the corn.
100 lbs. nitrate of soda top-dressing.
Yield, 55.2 bu. per acre.

Mrs. Ella Norman:
275 lbs. 3-8-6 under the corn.
200 lbs. 10-0-10 top-dressing.
Yield, 66.5 bu. per acre.

W. F. Westbrook:
300 lbs. 2-10-4 under the corn.
100 lbs. soda top-dressing.
Yield, 58.4 bu. per acre.

W. F. Brogdon:
Austrian winter peas turned under.
250 lbs. 0-12-4 under the corn.
No top-dressing.
Yield, 57.4 bu. per acre.

Ben Galloway and Cooper Brothers:
Austrian winter peas turned under.
400 lbs. 4-8-6 under the corn.

200 lbs. nitrate soda top-dressing.
Yield, 75.7 bu. per acre.

Mallie Norman:
400 lbs. 4-8-6 under the corn.
100 lbs. nitrate soda top-dressing.
Yield, 63.2 bu. per acre.

Davis Jenkins:
75 lbs. 2-10-4 under the corn.
200 lbs. nitrate soda top-dressing.
Yield, 79.7 bu. per acre.

In very few instances where a good crop of Austrian winter peas were turned under before planting corn was there any nitrate of soda used for top-dressing. But a careful study of all the fertilizer practices used by the farmers participating in the contest clearly shows that corn does need a complete fertilizer on Colquitt County soils, and it pays to use up to 400 pounds mixed goods plus either soda or up to 200 pounds per acre of 10-0-10 as a top-dressing. The excessive use of fertilizer has been discouraged by the agricultural workers in the county and the value of complete plant food plus plenty of humus in the soil stressed.

Many neighboring counties in Georgia have taken up the 10-acre corn contest idea. Both Thomas and Brooks Counties have put on contests this year that created widespread interest among their farmers and will in all probability rival in yields the Colquitt County results. Many other counties have become interested and are conducting some kind of corn-livestock program modeled after the Colquitt contest.

We believe the practices to be sound. We are encouraging better cultural methods, better crop rotations, along with better livestock. There are several farms with excellent first cross white-faced calves this year, offspring of the first eight purebred bulls given as prizes. There is a county-wide interest in livestock. There are many more good purebred bulls, boars, and breeding animals in the county now than there were three years ago. The farmers have learned that they can breed, raise, feed, and sell good hogs and cattle with feed raised at home, cheap feed in abundance, and that they need buy only small amounts of protein supplements, salt, and mineral matter for their livestock.

After carefully surveying the results of this new trend and then interpreting them in terms of future results it is hard to be anything but enthusiastic about the program. There is every reason to believe that it will spread to include all the great Coastal Plains belt of the Southeast. It has demonstrated fully that corn can be produced in sufficient yields and at low enough cost to make it a practical and econom-

ical source for feed on which to finish our hogs and cattle for the market. Corn can be stored and used when needed. For a long time we have been talking about our livestock program in the South. We have made great progress during the past few years, but we have been handicapped by low yields of basic feeds. It has now been proven that a satisfactory feed can be produced cheaply and in abundance.

The Colquitt County program calls for one additional thing that, if and when accomplished, should complete this picture. We plan to reduce our corn acreage from 75,000 to 50,000 acres and on the 50,000 acres produce a crop of 2,000,000 bushels of corn annually. The 25,000 acres taken from corn we hope to turn to oats, lespedeza, and permanent pasture. This will, when added to the present pasture lands, supply sufficient improved pasturage for our livestock, and we will be able to market an annual livestock crop worth more than $2,000,000. This crop when marketed will be adding to the fertility of our soils each year instead of depleting it, and fits in well with a general diversified farm program.

A Dressing for Cow Pox

Bathe the udders and teats of cows suffering from cow pox in a chlorine disinfectant (a tablespoonful to a gallon of warm water). Dry thoroughly with a clean towel and apply technical grade ether on a small piece of sponge to the pox lesions. Then paint with a mixture containing equal parts of iodine tincture, glycerin, and compound tincture of benzoin.

—*Successful Farming*

How Permanent Is Type?

Condensed from Holstein-Friesian World

Leslie E. Johnson

EACH year with the advance of the show season and the awarding of the purple ribbons, enthusiasm for dairy animals of excellent type reaches its annual peak. Although much of this enthusiasm subsides with the passing of the shows, good type retains an economic value which is shown by the prices paid for champions and by the fact that most breeders make their selections at least in part on the type of the individual. That type, good or bad, varies considerably and does not remain a fixed and permanent attribute of an animal (as is sometimes unconsciously assumed) is well known to showmen. Animals on the show circuit often change from one show to another and sometimes get out of condition so that they become unsuitable for exhibition in spite of the herdsman's best efforts. Records of senior champions often reveal that they were not good enough as calves to be used in the show herd. Furthermore, changes are often noted in production herds where the animals are never fitted for show. The amount of the type variation that occurs from time to time, however, appears not to have been given any detailed study.

Records kept on the type of Holstein-Friesian herd at Iowa State College have permitted a brief investigation of this problem. Since 1930 two independent sets of type ratings have been made on each animal in this herd. One set of ratings, known as station ratings, were made principally by Dr. J. L. Lush, in charge of the experimental projects in Animal Breeding. The herdsman and a graduate student were usually present when these ratings were made and some consideration was given to their independent opinions. Each animal was rated during the week it reached the ages of six months, 1, 2, 3, 4, 5, and 7 years. When rating the animals, care was taken not to look at any previous records. The second set of ratings known as judges' ratings were made by nationally known dairy judges at yearly intervals (one judge rating the herd each year). These ratings included all animals that were approximately six months of age or older. The standards established and used

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by the Holstein-Friesian Association for Official Inspection and Classification of herds were used in both classifications except the ratings were extended to younger animals. The terms used to describe the six classes into which the animals were divided were: poor, fair, good, good plus, very good, and excellent.

Table I shows the ratings of a few of the cows in the station classification. Considerable variation occurred in the type of some of the animals while others changed little if any during the seven-year period. For example, cows 867 and 1011 were rated nearly the same at all ages, whereas 1025 and 1234 were up and down in their ratings. Similar changes occurred in the judges' classification.

The permanence of the ratings as shown by the correlation coefficient of all consecutive ratings was .52 and .32 in the station and judges' classifications, respectively. If there had been no relationship between consecutive ratings of each cow the co-efficients would have been zero while if the cows had differed from one another but each cow had always received the same rating the co-efficients would have been 1.00. In the station ratings a little more than half of the total variation in the type ratings was due to permanent differences that existed between animals, slightly less than half to changes in the animals from one period to another, and a small portion to average differences in the ratings of animals at different ages. In general, the first age ratings were a little higher but insignificantly so than the average and the second and third were slightly lower. This

TABLE I

Sample Ratings at Different Ages in Station Classification

Cow	6 months	1 year	2 years	3 years	4 years	5 years	7 years
867					Fair	Fair	Fair
982			Good Plus	Good Plus	Excellent	Very Good	Very Good
1011	Good	Good	Good	Good	Good Plus	Good Plus	
1025	Good Plus	Fair	Good	Fair	Fair	Fair	
1069	Good Plus	Very Good	Very Good	Very Good	Good Plus		
1084	Good	Fair	Fair	Poor			
1110	Good	Good Plus	Good Plus	Good Plus	Very Good		
1234	Good	Good	Very Good	Fair			

Ratings from poorest to best: poor, fair, good, good plus, very good, and excellent.

was observed in both sets of data.

The ratings made at the different ages were compared to see which ratings were more closely like all the others. In both classifications the first age ratings (those under six months in the station classification and under ten months in the judges' classification) were somewhat inferior, being only about half as repeatable as the other ratings. At and above one year of age there was little difference in the repeatability of the ratings although there was some tendency for the older estimates to be more permanent and more like all others.

An increase in the length of interval between ratings had little effect upon their similarity. Ratings made four years apart averaged almost as much alike as ratings made only one year apart. This seems to indicate that most type changes take place within comparatively short periods and that there are few slow or steady trends which last two or more years.

In the station classification 132 of the females had three or more ratings. Forty - two of these changed one official grade or less, sixty-four changed two or less official grades but more than one, and twenty - six changed more than two grades. It is generally assumed that genuine changes in the animals are the major cause of these variations but (1) changes in the judges' ideals from one time to another (or between judges if more than one man makes the ratings), and (2) errors of the judge in making the ratings so that animals of approximate merit are not always given the same ratings, undoubtedly cause some shifts in type ratings. In an attempt to determine if the latter two causes were important as reasons for changes, verbal descriptions of the animals were written at the time of each classification and were studied. With the small to medium shifts in type no specific causes could be ascertained from these descriptions. Of the larger shifts, however, fifty per cent seemed to have been caused mainly by udder changes, twenty-six per cent by changes in general health, twelve per cent by inferior body conformation which later improved, and twelve per cent by miscellaneous causes, thus indicating that genuine changes in udder or general appearance of healthfulness are the major causes of at least the larger shifts. The large shifts occurred as frequently with the older animals as with the younger ones and were often found between consecutive ratings. A good example of the change that may take place in the type of a cow is that which occurred in the herd of Foy Finster, Eldora, Iowa. The cow as a yearling was a

rough, common, and unpromising heifer as judged by our present standards of type but developed into an excellent, mature individual.

In predicting future ratings the use of two previous records gave more accurate estimates than one. This was true in both classifications. The use of three ratings gave only slight increases in the accuracy of the predictions. This may have been due to the small number of animals in this part of the study as it would seem likely when repeatability of type ratings is low as was indicated in this study that a third, fourth, and possibly a fifth rating would give more information regarding the true type of an animal although of course, additional ratings would not add as much more predictive value as was gained by the first or second ratings.

Thus, it is evident that type is not a highly permanent attribute of an animal. In fact, the correlations of .52 and .32 indicate that type ratings are just about as repeatable as yearly milk or fat records. (Correlation co-efficients for consecutive milk or fat records of cows within a herd are usually about .4, rarely being smaller than .3 or larger than .5.) Dairymen can, therefore, place about the same confidence in the selection of animals on the basis of one type record as they can on the basis of one production record. In view of this, breed associations may in the future find it desirable to repeat type classifications for several years in order to locate the animals which truly are among the breed's best in type.

This study indicates that: (1) type as indicated by one inspection is of about the same permanence as yearly milk or fat records, (2) ratings made at young ages (under ten months of age) are not as repeatable as those made at one year of age or older, (3) ratings increase in repeatability only slightly, if at all, after one year of age, (4) ratings made two, three, and four years apart are about as much alike as those made one year apart, (5) changes in udder and in general health may cause large shifts in type ratings, and (6) two ratings and possibly three or more are desirable in estimating an animal's future type. Thus, breeders should be rather conservative in the selecting or culling for type on the basis of single ratings or at very young ages.

Pasture Champions

Condensed from Kansas Farmer

Roy Freeland

EIGHT Kansas stockmen who "have a way with grasses" are winners of $200 in the 1941 Kansas Farmer Pasture Contest. Competing with farmers and ranchmen from all parts of Central and Western Kansas, they headed the longest list of entries ever received in six years of contest competition.

Champion range pasture grower of the state this year is Arthur Wurth, cattleman of the short-grass country, who runs Herefords on 2,100 acres of pasture in the picturesque red hills of Clark county. Mr. Wurth keeps his native grass pastures in top condition by using supplemental, temporary pasture crops in seasons when the native grass needs rest.

Forty-eight acres of rye and 100 acres of wheat provided valuable supplemental pasture in fall, winter and early spring, while thirty-five acres of Sudan grass carried heavy loads to relieve the native grasses in July and August. This made it possible to rotate the cattle back and forth on native pastures, giving the grass adequate opportunity to maintain a good sod.

With this system, pasture on the Wurth farm made gains of nearly 1¼ pounds a day on yearling steers, over a 11-month period this year. Because his grasses bring him more profit than any other crop he raises, Mr. Wurth has seeded native grass on 165 acres of cultivated land. The seeding was done in February last year, with a power-broadcast machine that blew the seed out over the land.

Seeding six pounds of Grama grass seed to the acre, the entire cost of seed and labor was less than $225. An excellent stand was obtained on all the land seeded, and within another year, Mr. Wurth expects a good native sod on this land that was cultivated until the spring of last year. For additional improvement to his pastures, Mr. Wurth built four ponds and mowed ninety-five acres to eradicate weeds and shrubs.

In the diversified division, state championship honors were won by Carl O'Hara, who operates a general farm near Partridge, in Reno county. Carl has perfected a program which supplies pasture for livestock every month of

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the year. During the fall months, his stock graze on native pasture, first-year sweet clover and cereal grain crops.

In late fall and winter, wheat and rye pastures are used extensively, with rye carrying heavy loads of livestock until late in the spring. Along about the first of May, second-year sweet clover comes in for some heavy grazing. This season Carl's second-year sweet clover carried nearly three head of mature cattle to the acre for three months. At the same time, 105 head of sows and pigs were living in luxuriant alfalfa pasture.

For hot summer months, and on into the fall, Carl uses the old stand-by, Sudan grass. This year his Sudan grass carried nearly two mature animals to the acre. Altho temporary grass crops provide the principal source of grazing on Mr. O'Hara's farm, he feels at least one good native pasture is essential.

For that reason, he is turning a 30-acre field back to native grass. To get the native grasses started in this field, he cut Bluestem and Indian grasses along the roadside with a binder. The grasses were scattered in his 30-acre field, and the land was then disked lightly. The pasture is sodding rapidly and will soon be good enough for grazing.

Second prize in the diversified pasture division was awarded to C. A. McClaughry, Sedgwick county dairyman, who operates 360 acres near Wichita. Rating pastures as his most important crops, Mr. McClaughry uses alfalfa, first- and second-year sweet clover, wheat, rye, barley, oats, Sudan and native pastures in his year-around system.

Topping the largest number of entries in any one Kansas county, Arthur Reichert, of McPherson, was named McPherson county champion and later was selected by the state committee as winner of third in state competition. Like the two top state winners, Arthur planned a year-around system, featuring sweet clover, Sudan, and cereal crops as the principal grasses. A similar program was followed by the fourth prize winner, Will Kasitz.

Second prize in the range division went to L. D. Morgan, who controls 2,560 acres in Sherman county. Morgan keeps his wide acres of shortgrass pasture in excellent condition by deferred and rotation grazing, along with use of supplemental grass crops.

The Kansas Farmer Pasture Contest, an annual affair since 1936, is sponsored with close cooperation from resident agronomists and extension workers of Kansas State College. E. A. Cleavinger, and L. L. Compton, extension crops specialists, worked with county agents in organizing tours and inspection trips.

What's New in Vegetables for 1942?

Condensed from New Jersey Farm and Garden

WHAT'S new in vegetables for 1942? The answer is supplied by the "All-America Selections," of Harrisburg, Pa., the organization whose responsibility it is to register all new varieties of seeds. Samples of all proposed new varieties are planted in trial grounds in different climatic sections of the country, and from scoring and reports of the judges in charge of these competitive trial grounds, the really different and superior varieties are determined. Winners are recommended to the seed industry and the growers of North America.

The All-America Vegetable Selections for 1942 introduction are not in large quantity supply this very first year they are offered. But, all gardeners have an opportunity to get some seeds of them, through their own favorite seedsmen. The following varieties have been found superior to others of their kinds or for their recommended purposes, and are the 1942 All-America Vegetable Selections.

Decatur Pole Bean wins the only Silver Medal award in two years. It is recommended for both home and commercial plantings, wherever pole snap beans grow, so will be a widely welcomed member of the pole varieties, the heaviest bearers of them all. Improving pole bean quality, Decatur produces long, practically round, nearly straight, stringless, meaty pods of fine quality. It vigorously grows to six or seven feet tall and starts its prolific bearing early in the season. The small white seeds are fine for dry or shelled beans. We don't like to think of garden troubles and Decatur will help us forget them. It is resistant to bean rust and common bean mosaic.

As beans are the most important home garden vegetable, we are fortunate in having another fine new variety to plant. Medal Refugee is a bush snap, good for shelled beans because it is white and it is also resistant to common bean mosaic. It is hard to beat for high yield, easy picking, ideal size and shape for whole green beans. The pods are round, smooth, stringless, straight to slightly curved, and silvery green. It is recommended for home and canning use and wins a Bronze Medal.

One other vegetable wins a Bronze Medal and we must thank Dr. Ralph Singleton, of the Connecticut Experiment Sta-

Reprinted by permission from New Jersey Farm and Garden, Sea Isle City, N. J., Jan., 1942

tion, for producing another hybrid sweet corn winner. Lincoln is a grand midseason variety. Of uniform tall growth, large eared and of delicious eating quality, it is a heavy producer of eight-inch, tapering ears, well filled to the tip, and of a bright golden color. Being ready to use in about eighty-five days from planting, it should displace previous hybrids for both home and market use. With its plentiful supply of fodder, it should also be a most desirable farmers' market corn.

Honorable Mentions, which are strong recommendations in the All-Americas, go to six new vegetable varieties. They have definite superiorities and advantages and should be carefully considered.

There are two varieties of lettuce demanding attention. Cosberg 600, raised by Dr. Ross C. Thompson, Bureau of Plant Industry, is a combination from Cos and Iceberg, similar to the original Cosberg except as much as ten days earlier. Its chief value is earliness and sure heading qualities, even under adverse conditions, when standard varieties failed to head. It has smaller heads than Hanson and Iceberg and without their bronzing. For home and market use.

New York PW55 is the name of the other, a very early New York type, of compact growth, medium size, with small core and showing remarkable resistance to tip-burn. The earliest crisp-leaved lettuce, it should have as wide adaptation as White Boston for spring planting, both for home and market use. The uniform rounded heads are very solid and compared with Imperial 44, was a week earlier and the only variety producing as high a percentage of good heads.

A novelty and a good one is Fordhook Zucchini Squash. It's a long, streamlined Black Zucchini, on bushy, heavy bearing plants. Eating or market size is about twelve inches long and two inches across, though it grows to double those measurements. Like other summer squashes, it should be picked when small and tender while seeds are immature. The long, blackish dark green fruit is attractive and delicious, borne closely around the base of the plant.

Topflight Bantam is a hybrid sweet corn from the corn belt. It is a tall vigorous grower, with uniform, perfect yellow ears of twelve to sixteen straight rows of deep grains on small cobs. It is a heavy yielding, big-eared, midseason corn.

The other bean is a bush snap variety called Long Island Longpod. It is extremely productive of long, slender, flat pods, a few days later than the earliest variety, Bountiful. It is disease resistant and should make a profit-

able shipping bean, fibrous though stringless and dark green, on a very vigorous plant.

Louisiana Green Velvet Okra is the answer to some real prayers. Being round and velvety to the touch, like White Velvet, instead of ridged or corrugated and spined, we have a prolific and tender green okra for home and market.

These latest improved vegetable seeds should be available through any good seedsman.

Jersey Bogs Yield Sphagnum Moss

Condensed from Pennsylvania Farmer

Arlene Reasoner

THROUGH the summer months, New Jersey farmers living near cedar swamps carry on the harvest of sphagnum moss. They start out daily with 'tater rakes, grapnels or drags to gather tons of this moss, which becomes an essential of medical surgery during wartime and is always in demand by florists and nurserymen, not only in America but in Canada and Porto Rico as well.

Clarence E. Corliss, of Warren Grove, N. J., has been harvesting sphagnum moss for thirty years. From spring to fall he uses three and five-tined 'tater rakes to drag his crop from the beds of the cedar swamps in the vicinity.

How It Is Cured

The procedure of curing and baling was described by Mr. Corliss. "After the moss is raked out," he said, "it is collected in piles on higher spots of the marsh, then slung on a hammock while part of the moisture drains. Next it is taken to the uplands and spread out to continue drying. Later, tied in thirty or thirty-five pound bales, it is sold for an average price of sixty or seventy cents in summer. Late in the fall and during the winter, returns from wholesalers may reach one dollar per bale."

Moss is harder to find now than when he began harvesting this unusual crop, Mr. Corliss reports.

"Under ideal conditions, sphagnum requires three years to grow to a length suitable for harvesting," he said. "Then care must be taken not to rake too clean. If no seed remains, the moss will disappear."

Use in War

On September 2, 1916, the front cover of the London Graphic carried the query in bold face type, "Are you collecting

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sphagnum moss?" By November, 1918, the Scientific American Supplement carried a similar appeal for large quantities of the moss which was of great value in surgical dressings.

Although present cotton prices give no indication that a war shortage of this product may occur again, the duration of the conflict will be the chief determinant. Should cotton absorbent reach exorbitant prices, with a corresponding decline in quality, during the present War, as it did during the period between 1914 and 1918, there is little doubt that sphagnum moss will be recalled to provide a highly satisfactory substitute.

The American account of sphagnum moss which appeared in the Scientific American Supplement was published by Professor George E. Nichols of the Sheffield Scientific School, Scotland. England, Ireland and Wales were already collecting the bog moss for medical dressings. Some was gathered in Canada and the Pacific Northwest, but the latter was too far from the Atlantic Coast, and transportation costs made it imperative to find eastern sources.

Professor Nichols related that late in the 1870's a workman in the peat moors of northern Germany sustained severe wounds of the forearm. His fellow workmen, with nothing else available, wrapped the arm with peat. Ten days later he was able to get surgical aid. So great was the physician's amazement to find the wound almost healed that he began the first scientific experiments with sphagnum moss, from which peat develops. Soon similar investigations were underway in many parts of Germany.

Within a few years after the German investigations began, sphagnum became a standard material for surgical dressings both in private practice and in some large hospitals in Germany. After trial in several war hospitals sphagnum dressings were finally accepted by the British War Office in September, 1915.

With official recognition of the dressings the Red Cross began providing them. Late in 1915, and during the remainder of the war, American Red Cross units turned out about 20,000 sphagnum surgical pads a month, but this was on an extremely small scale as compared with the work of other countries.

"As sphagnum was used to replace cotton for pads or compresses in absorbent dressings, it was found in many cases to be superior," Professor Nichols reported.

"Sphagnum absorbs liquids three times as fast and will take up greater amounts than absorbent cotton. A pad of the latter will absorb five or six times its

weight of water. An average pad made of sphagnum will take up sixteen to eighteen times its weight of water—more than three times as much as cotton. Exceptionally good moss will absorb as much as twenty-two times its own weight of water.

"The moss retains liquids better than cotton so that such a dressing need not be changed as often.

"Sphagnum also has the valuable property of distribution. Whatever liquid is absorbed by the pad is distributed through the whole mass. Sphagnum sucks up fluid discharges until it is uniformly saturated throughout. On the other hand, a cotton pad ceases to function long before its theoretical capacity is reached.

"This natural growth from the cedar swamps is as soft as cotton and seems to be endowed with some healing properties which other absorbents lack. While a regular cotton pad is entirely satisfactory in a normal hospital operation, in which the wound is entirely sterile, war injuries, which are non-sterile, showed more rapid improvement when the moss was applied."

Failure to discriminate between species of sphagnum moss probably accounted to some extent for the fact that such dressings were less popular with American army surgeons than with surgeons in the other allied armies. Although about twenty-five different kinds of sphagnum are recognized in most of the eastern states, only two or three can be used in surgery.

The best sphagnum is identified as Sphagnum papillosum. It has never been found south of New Jersey. Other good varieties which are found in swamps throughout the East are Sphagnum palustre, Sphagnum magellanicum and Sphagnum imbrecatum. Even the same species may vary widely in different localities so that it will be highly desirable in one section and almost unusable in another.

While still damp, foreign material is discarded from the moss and it is classed according to quality either for use in dressings or for bed pads. Sphagnum intended for medical use during the first World War was dried just as for present-day florist and nursery orders. Artificial heat was avoided because it tended to make the moss abnormally brittle.

Simple pads of moss, incased in sterile gauze so that no fine particles could work through the cloth to irritate the wound, were passed through clothes wringers before packing and shipment abroad. This reduced the fluffiness and bulk of the moss.

Ordinarily, hospitals sterilized the pads just before using. However, if dressings were destined for field or emergency hospitals

it was necessary to dip them in antiseptic solution.

Since shortly after the first World War scientific and medical journals have ceased to mention sphagnum moss.

Marshall Reeves of Barnegat, present-day wholesale dealer for sphagnum moss, states that nurserymen prefer it for shipping because it holds moisture around the plant roots longer than most substances.

"Sphagnum is used in the operations of grafting and propagation of such plants as will produce new roots whenever a fistful of bog moss is tied around the stem, which after the adventitious roots have appeared is severed below the ball of moss."

The dry moss is also used for stuffing wreaths and floral pillows so that flowers covering the surface can be held firmly in place by the moss.

Mr. Reeves buys about 2,500 bales a year and estimates that six other dealers near Barnegat each buy nearly as much, probably paying between sixty and seventy cents per bale during the summer season. There are also a few scattered buyers in other sections of the state.

In good areas, during a wet season, it is expected that one gatherer may harvest about 1,800 bales in a season. This moss is found in several sections of New Jersey wherever cedar swamps are plentiful.

To offset the scarcity of cedar swamp sphagnum moss near Barnegat some attempts have been made to grow moss on maple beds. "This hasn't been satisfactory," Mr. Reeves declared. "The maple gives an inferior quality with too many hairy tendrils."

Rust Remover

It is now more necessary than ever to keep equipment in good condition. A rust remover will often prove helpful to keep machinery in A-1 shape. A compound of:

Oxalic acid .....20 parts
Phosphoric acid ...20 parts
Glycerine .....10 parts
Ground Silica .....50 parts

is reported to be of aid in removing rust. The paste is placed on the rusted parts and allowed to remain fifteen to twenty minutes. It then is washed off and will carry the rust away with it. This should be done in a warm place.

—*American Fruit Grower*

Long-Range Economy in Pruning

Condensed from American Fruit Grower

Freeman S. Howlett
Ohio Agricultural Experiment Station

ALTHOUGH pruning is not the most expensive of orchard operations, it represents from five to ten per cent of the total cost of producing a bushel of fruit. For that reason it behooves the fruit grower to keep the cost of pruning at a minimum. It is pertinent to note that no practice is less standardized than pruning. No other procedure is carried out to such an extent, according to the ideas of the individual orchardists and their workmen. This is true not only in the training of newly planted or young trees, but also in the care of bearing orchards. Years of service seem to be the chief qualifications for the pruner. However, pruning programs should be planned now to eliminate mistakes of the past since increased efficiency is also increased economy.

Developing a strong framework in the young tree seems to offer the greatest opportunities for future improvement. Too many laterals, developing on the young apple tree, frequently are allowed to become primary scaffold branches.

Sometimes the trees, when obtained from the nursery, have been headed back too drastically as whips, thus preventing the development of satisfactory vertical spacing of those laterals which are to comprise the primary scaffold branches. No outstanding improvement can be made in this connection until nursery trees are headed higher and until fewer laterals are allowed to form the primary scaffold system. Until these higher headed trees are available, limitation of the number of primary scaffolds to four would seem reasonable.

Narrow crotches, too weak to hold satisfactory crops are found too frequently. The recent windstorm in Ohio broke branches of young peach trees with no crop but, in some instances, they would have been saved if the excessively narrow angles of diverging branches had been more carefully eliminated. The early years of the tree are exceedingly important and pruning then should be done only by those who know how to space branches vertically to the best advantage, how to improve the crotches of a tree, how to suppress undesirable growth, and how to select second-

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ary scaffold branches. The time involved in labor during this particular growth period is relatively small but all emphasis must be placed upon skill.

Non-bearing trees in which the scaffold branches are well established usually are pruned very little. In this respect, most orchard practice shows little variation. Faulty framework may be improved by a discreet workman but this is no place for mass pruning by an inexperienced worker.

The fact that a tree will not cease to bear, if pruned biennially or even triennially, is responsible for the tendency to prune at irregular intervals. It is generally admitted that a progressively greater proportion of the fruit is smaller in size and less attractive in color as the tree thickens. So, until this result is apparent, pruning often is delayed. Frequently, pruning is a delayed too long and mediocre fruit results.

The problem of pruning bearing trees is complicated chiefly by the problem of alternate bearing. Present knowledge indicates that alternate-bearing trees should be pruned in their "on" year. If it were known that annual pruning would insure annual bearing, even in the trees generally considered as annual in bearing but which show a slightly heavier crop in alternate years, then the recommendation would be simple but, since no pruning practice can be relied upon to maintain annual bearing, the practice of delaying the operation until the fruit becomes unsatisfactory is understandable.

Pruning of bearing apple and peach trees can be satisfactorily carried out if the supervisor knows his objectives. Few cuts on a bearing tree can be made in just one way and the chief danger there lies in overpruning rather than in underpruning. The recognition of crossing and rubbing branches, the heading back of those that are too high, together with the thinning out of small branches, does not require experienced skill, a circumstance which may allow certain economies at the present time. However, long-range economy can be secured by including in present pruning programs the herein mentioned features for improvement and, doubtless, more economy will be achieved in this manner than in the sporadic system.

Actually those measures which will constitute a safe economy now might well be put into practice at all times. Certain adjustments to present needs and conditions may have to be made but, in general, orchard management is a business which seems to need its books balanced, not alone after the crop is harvested and sold but long before.

New England Turns to Barbecued Chicken

Condensed from American Agriculturist

G. T. Klein

Massachusetts College of Agriculture

BARBECUED chicken has been given a place of prominence in New England. Along with the clam bake, the boiled dinner and Boston baked beans, it has been accepted as a favorite on the bill of fare. The firemen at their annual picnic, the Masons, the Farm Bureau and the poultry associations have put an "okey" on it and along New England highways the number of barbecue signs makes one think that he might be driving through Dixie.

My first introduction to it was as a small boy when a relative returned from Texas filled with enthusiasm for this Southern delicacy. At a family picnic, I learned something of the art. With me it made such a hit that since that time I have praised its merits to my friends. There has never been a regret, for everywhere it has been accepted with enthusiasm and praise.

For the family picnic there are charcoal broilers available that quickly barbecue the chicken on the two sides at the same time. It is less than a twenty minute job and three halves are cooked at one time in the large grill that is a part of this equipment. Salt is sprinkled on the chicken when the barbecuing starts and it improves the flavor to add more just before the cooking is complete.

For the larger group, a barbecuing pit is better suited for the job. This pit is about three feet wide and it varies in length according to the number of chickens that are to be cooked. The depth of the pit depends upon the kind of fuel used for the fire. If coals from the burning of wood are to be used, the pit should be about fifteen inches deep. For charcoal, it is about the same.

After the pit has been dug and the fire started, the chickens are barbecued on poultry netting. The best wire is the 16 gauge, 1½ inch mesh hex wire that commonly sells under the name of "fox wire." The weight is carried on iron pipes laid across the pit and it is kept tight with iron stakes driven in the ground on the two ends and the sides of the wire. The wires should be adjust-

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able in height from the fire because it is very difficult to gauge the amount of heat and it is important to be able to raise or lower the wire to get the right amount of cooking. This can usually be done by putting stones under the pipes.

When wood is used for the heat, the fire must be started several hours before hand. It is not safe to start broiling until there are at least four inches of coals. If a supply of charcoal is at hand, part wood and part charcoal makes a good combination. The charcoal should not be added until one is ready to start the broiling for it burns up quickly. Charcoal may be used entirely and started with paper, kindling and kerosene.

A chicken that weighs about 2¾ pounds is the best weight for barbecuing. It is split by removing the back bone and breast bone and of course the neck, making both pieces exactly the same size. The broiler is split by cutting along the back on either side of the bone. The neck, crop, lungs and complete intestines may be removed after the carcass has been laid open. By making a cut on either side of the breast bone near the front of it, this also can be completely removed. The bird is then cut in two pieces exactly the same size by cutting through the breast meat.

There are many foods that can be served with barbecued chicken. As most of our picnics are held during vegetable season, we use tomatoes, slaw, corn and usually potato chips, rolls, butter and ice cream and coffee.

The barbecue has commercial possibilities. They are getting to be regular events on Sundays at some of the poultry farms during the summer. Those who specialize in them are frequently hired by groups to put on barbecues. The promotion of them is another way of increasing the consumption of poultry meat to the betterment of the poultry industry.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

Breeding Your Own, or Raising Colts for Pleasure and Profit—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Conservation in the United States—By Gustafson, Ries, Guise and Hamilton. Comstock Pub. Co. $3.00.
(See Farmers Digest, July, 1940)

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

Electricity in the Home and on the Farm, by Forrest B. Wright ($2.75). Published by John Wiley and Sons, Inc.
(See Farmers Digest, November, 1941)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

Farm Management—By Robert R. Hudelson. The Macmillan Co. $1.80.
(See Farmers Digest, February, 1942)

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

Forestry in Farm Management—By R. H. Westveld, and Ralph H. Peck, John Wiley and Sons, Inc. $3.00.
(See Farmers Digest, September 1941)

Fruit Crops—By T. J. Talbert, Prof. of Horticulture, Univ. Mo., and A. E. Murneek, Asst. Prof. Horticulture, Univ. Mo. Lea and Febiger. $3.75.
(See Farmers Digest, June, 1941)

Hunger Signs in Crops—Published by the American Society of Agronomy and The National Fertilizer Review. $2.50.
(See Farmers Digest, October, 1941)

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.
(See Farmers Digest, January, 1941)

Livestock and Poultry Diseases—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.
(See Farmers Digest, February, 1941)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

Poisonous Plants of the United States—By Walter Conrad Muenscher, Prof. Botany, Cornell. Macmillan Company. $3.50.
(See Farmers Digest, November, 1940)

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $4.00.
(See Farmers Digest, November, 1941)

Plant Ecology—By W. B. McDougall, Regional Biologist, Santa Fe, New Mexico. Lea and Febiger. $3.00.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.
(See Farmers Digest, December, 1940)

The Nutgrowers Handbook—By Carroll D. Bush (Orange Judd Publishing Co.). $1.75.
(See Farmers Digest, January, 1942)

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw-Hill Book Co. $5.00.
(See Farmers Digest, May, 1940)

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.
(See Farmers Digest, March, 1941)

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The Johnson Press, Ambler, Pa.